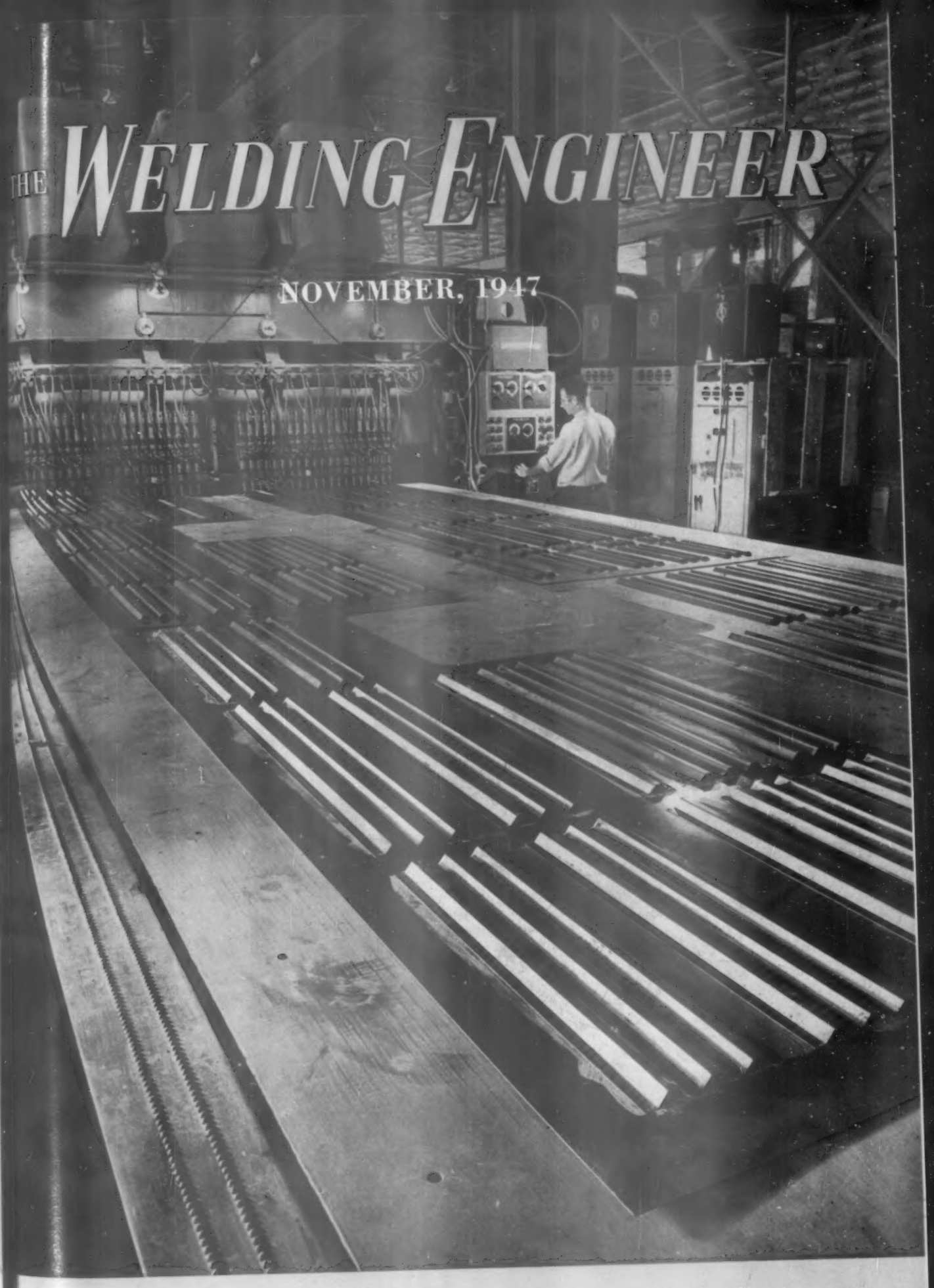
THE WELDING ENGINEER

NOVEMBER, 1947



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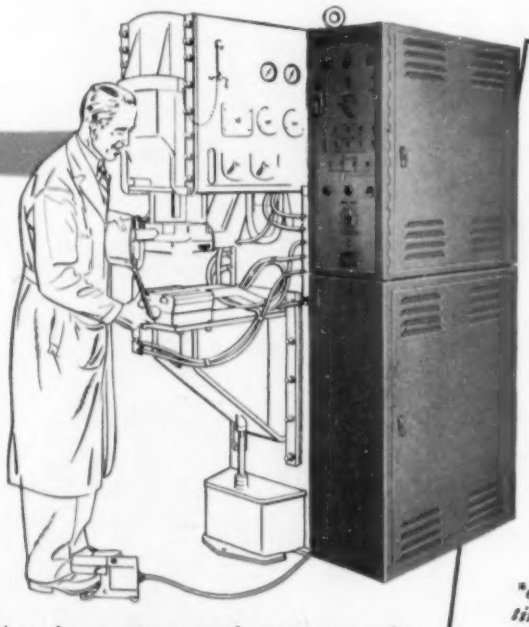

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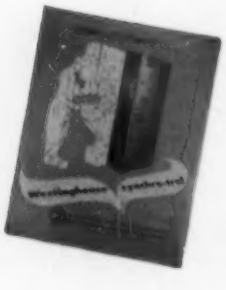

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THE WELDING ENGINEER

THE WELDING ENGINEER, *with which is combined The Acetylene Journal*

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Volume 32 - Number 11 *November, 1947*

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PUBLICATION OFFICE, 210 S. Desplaines St., Chicago 6. EDITORIAL OFFICE, 520 No. Michigan Ave., Chicago 11. EXECUTIVE OFFICES, 330 West 42nd St., New York 18, N. Y.

Return postage guaranteed. Branch offices, Chicago, San Francisco, Washington, Philadelphia, Cleveland, Detroit, Pittsburgh, St. Louis, Boston, Atlanta, Los Angeles. Published monthly.

McGraw-Hill Publishing Company, Inc. Entered as second class matter Sept. 12, 1947, at the Post Office at Chicago, Ill., under the act of March 3, 1879.

Subscription rates:

Single copy 50c. United States and possessions $5.00 per year, $8.00 for two years, $10.00 for three years. Canada $6.00 per year, $10.00 for two years, $12.00 for three years. Pan American countries $10.00 per year, $16.00 for two years, $20.00 for three years. All other countries $15.00 per year, $25.00 for two years, $30.00 for three years.

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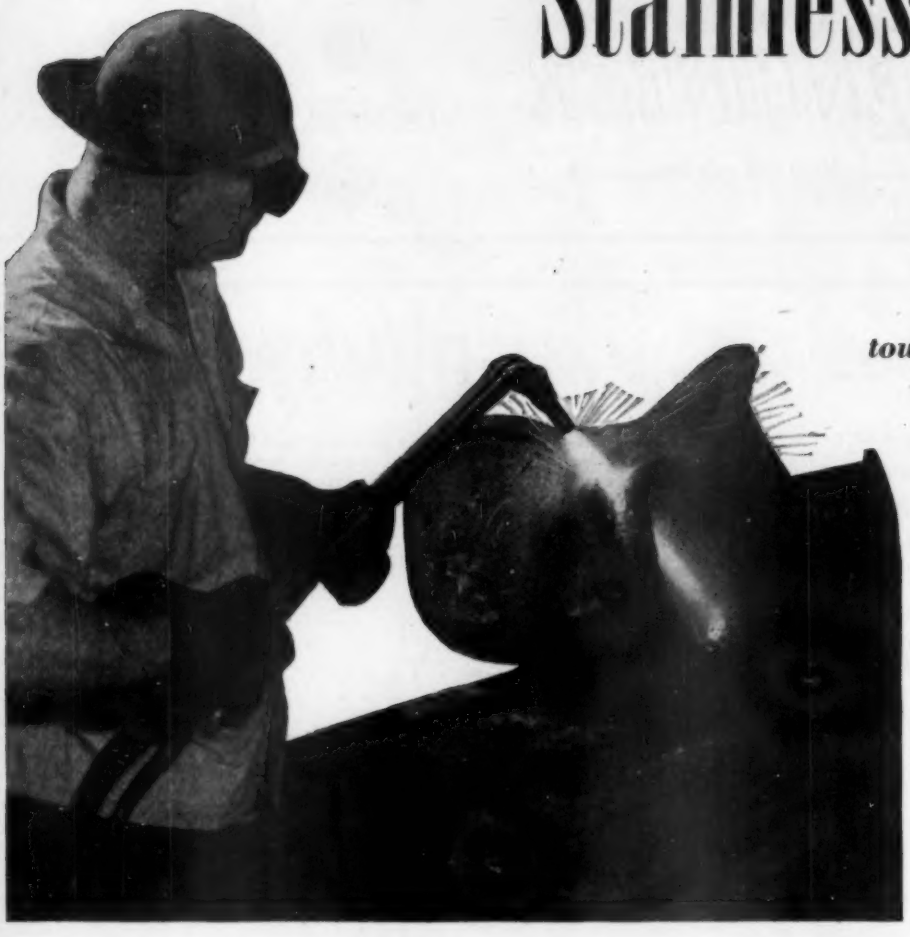
Stainless Steel is TOUGH



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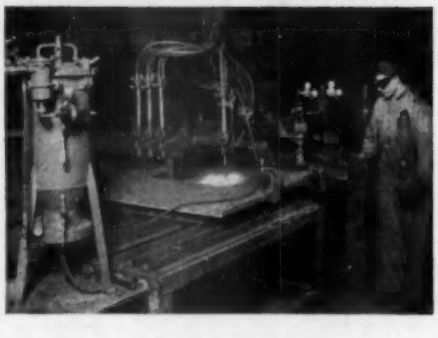

IN FABRICATING PLANTS—

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ESTABLISHED 1916 — THE WELDING ENGINEER — NOVEMBER, 1947

Passing the Buck

IN RECENT years passing the buck has become an American national pastime. Rarely, however, do you see so glaring an example as that revealed in a recent letter sent out by a certain aircraft manufacturer to purchasers of his planes. The planes in question had wings on which the skin was roll-spot welded to the stringers. His letter read in part:

"During one of the most critical phases of our production acceleration we found ourselves short of automatic riveting capacity. In order to maintain production at the planned level, we made some experimental roll-welded skins and installed them on test wings. These tests indicated that the roll-welded skins were equally as good as the riveted skins. However, there was not time sufficient to accumulate a year of testing or a thousand hours in the air on any such unit. For that reason, the roll-welded skins did not receive the thorough testing that was imposed upon the riveted skins.

"Periodic inspections of some of the airplanes with the roll-welded skins have shown a minor and relatively unimportant crack in the vicinity of some of the weld spots. Although these cracks are of no structural significance at this time, they do indicate that the roll-welded skins will not stand up over the desired life of the airplane, on a par with the riveted skins. For that reason they are being replaced . . .

"Roll or spot welding will continue to be used on parts which are not subjected to the constant flexing that is imposed on wing structures by bumpy air. This method of fabricating structures is economical and efficient and helps to keep down the cost of metal airplanes."

Most of us connected with the welding industry know that spot and other forms of resistance welding have long been used almost exclusively on primary plane structures by a large number of aircraft manufacturers. We also know that fatigue tests on individual specimens have shown spot welding to be equal to or better than riveting, providing the correct technique is employed.

We sadly suspect that our manufacturer friend is passing the buck. Everyone familiar with spot welding knows that cracks in the weld nugget indicate that the weld has been improperly made. Usually, these cracks are the result of applying too much heat and may be attributed, in most cases, to a lack of proper control on the welding equipment or to simple carelessness on the part of the employee setting up the welding time sequence. Let us repeat the proved fact we have previously stated: a properly made spot weld is at least equal to a rivet in fatigue strength.

In most instances, where welding is blamed we find that poor workmanship is the real culprit. We suggest to this aircraft manufacturer that he spend less time in writing letters about the faults of welding and more time to an inspection of his own plant. with particular regard to quality control. It's easier to pass the buck, though.

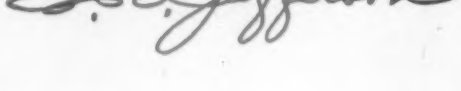

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Fig. 1—Cylinder heads and blocks come to Twin Cities Welding, Omaha, from all over the country to be repaired

Cylinder Head Welding

Under the slogan, "Equal to new when we get through," the Twin Cities Welding and Parts Co., Omaha, has built up one of the most successful repair businesses in the middle west

BY T. B. JEFFERSON

DESIRABILITY of meeting the "ill wind that blows no good" may have often been questioned. Nevertheless, Mr. and Mrs. Claude Brackett of Omaha were on the receiving end of the benefits one fateful day in 1940. It was an ill wind—literally—that blew them to success.

In Business or Bust

Fourteen months previously the Bracketts had moved to Nebraska from McPherson, Kan., in order to start a job welding shop. Their assets were courage and ability, willingness to work hard, $600 in cash and an old car. Their second-hand gas-welding outfit had cost them $12, their used arc-welding equipment $25. With these, they set out to conquer a city.

First, Mr. Brackett rented a building at 2559 Leavenworth St. and put up a large sign across its front proclaiming that this was the Twin Cities Welding and Parts Co. It was a large building—so large that it still had a vacant appearance even after they had set up their meager welding equipment and miscellaneous tools. A second-floor storeroom was converted into living quarters, enabling the Bracketts to be close to their work and also cut expenses. Despite all this, the building still didn't look as though anyone had moved in, which was, perhaps, one of the reasons why potential customers persisted in ignoring its welcoming sign.

Business was scarce the first year—so scarce that it looked as if the new enterprise was going to fold up before it started. Finally, Mr. Brackett had just about reached a decision to quit his job shop altogether and go back to welding at a weekly wage. He was dissuaded from this by his landlord, to whom he now owed a large amount of back rent. "Stick it out," encouraged the friendly landlord. "Things are bound to get better."

A Freeze in Time

The turning point came on Armistice Day, 1940, with the aforementioned ill wind, which blew in freezing weather of ten degrees below zero. Ordinarily, Omaha doesn't get such a cold spell before January, and the cars of its citizens simply weren't prepared to meet it. On the following day there was a regular epidemic of cracked cylinder heads and blocks. Then people began to remember that the Twin Cities Welding and Parts Co. had been advertising that these could be repaired by welding.

The victims of the storm took Brackett at his word. Very shortly his shop was filled with cracked heads and blocks from all over the middle west. He went to work. Day after day he worked, scarcely taking time out to eat or sleep while he reaped the harvest that the sudden change of weather had given him.

★ MAINTENANCE

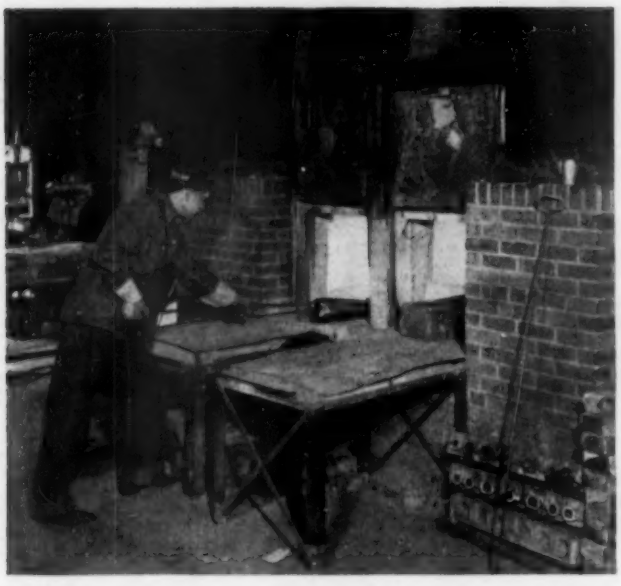


Fig. 2—This gas-fired furnace preheats the cylinder blocks to proper temperature for successful welding

Fig. 3—Oxy-acetylene welding has proved best for the cast-iron heads. Preheating continues during welding

Before all the storm damage had been repaired, Brackett was able to pay his landlord the back rent of $600, pay up all of his other creditors and still have a little working capital left. From that time on, Twin Cities Welding began to prosper.

To illustrate how this small business has grown since the memorable Armistice Day freeze, a few figures may be quoted. In 1940 the total gross business was $3,200 and payroll (one employee) $880. In 1946 the Bracketts grossed over $100,000, and their twelve employees received over $30,000. The payroll would have been even larger last year if competent help could have been secured.

During the same period the value of equipment has grown from $37 to $20,000. On top of this a $40,000 inventory of parts is carried in stock.

Exchange Service

Much of the success of Twin Cities is based upon its convenient exchange service for customers. To illustrate, a customer can bring in a cracked cylinder head and take out an exchange head immediately. He does not need to call again. The head he brought in is repaired and placed in stock as another replacement head. And so on.

The exchange plan provides the least expensive and fastest service possible. A flat price is made, the same to all customers, provided that the head brought in is in a repairable condition. The customer receives an exchange head that has been repaired by welding, tested, surface ground and repainted to look like new.

So far as competition is concerned, the Bracketts do not need to worry. There are, Mr. Brackett states, only four other shops in the country which have the knowledge and equipment to weld and machine blocks and cylinder heads for any make of engine, gasoline or Diesel, used in any passenger car, truck, bus or heavy industrial equipment. Of these four shops, one works exclusively on Caterpillar Diesels. Twin Cities is also the only shop that is in a position to repair or completely rebuild engines of any make or type. The firm does other job welding, but its major work is in the repairing of heads and blocks. Biggest customers are automotive repair shops, for whom heads are repaired on a wholesale basis.

Assembly-line production has long been necessary. A trip along the assembly line will give a clear idea of how blocks and cylinder heads are being welded.

When a cracked cylinder head or block is received on the exchange basis, it is put into the common pile for welding at some future date (Fig. 1). Most of the exchange work is done on Chevrolets or Caterpillar heads. If a particular head is to be returned to a customer, it is marked for identification and then checked to determine where the cracks are located. The cracks found are chipped and each is checked with penetrating oil to make sure that the entire crack has been chipped out.

The head or block is placed in the oil-fired preheating oven (Fig. 2) and brought up to a uniform preheat so that all of the scale, dirt and other foreign materials will be loosened or removed. The block is next placed in an enclosure built of firebricks for welding. This tends to retain the preheat to a certain extent, but the welding oven is usually left open on top to permit the weldor to begin the repair job. Hence a supplemental preheating torch or torches play on the part (Fig. 3) to insure the maintenance of the preheat during welding.

Use Cast-Iron Rods

All of the head and block welding is done by the oxy-acetylene process. A cast-iron rod 3/16 in. in diameter is used to avoid difficulties with regard to color match. Plenty of flux is kept on the rod during the welding operation, and a soft neutral flame is used. Flame adjustment is extremely critical as a forced flame has been found to cause pinholes to form in the weld metal.

The weldor starts at the bottom of the vee and works up. Since the crack has been chipped into the water jacket, care must be exercised to see that "icicles" or other obstruc-

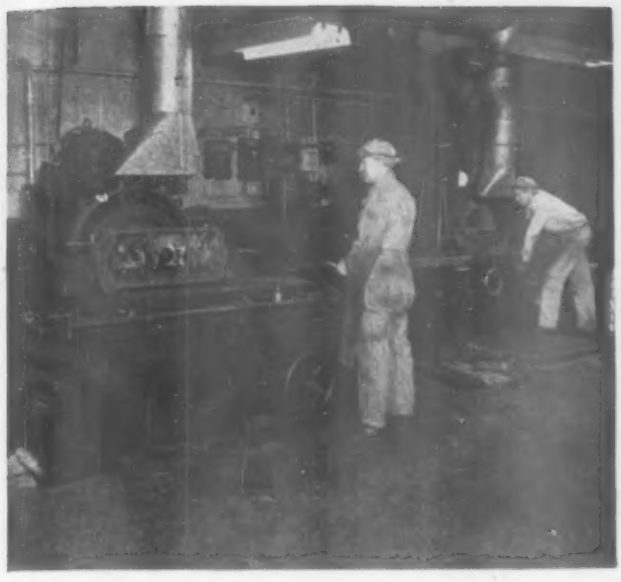


Fig. 4—The large grinder at left is used on larger heads and blocks, the one on the right to finish small heads

Fig. 5—Hundreds of cubic feet of acetylene are consumed monthly, all coming from these two generators

tions are not formed inside the jacket. The weld puddle is kept molten slightly longer than usual so that entrapped dirt will be floated out and pinholes will tend to close. These actions are aided by the preheating flame, which also contributes to the machinability of the weld zone.

Drastic Quenching Treatment

After all cracks have been filled, the repaired part is given a treatment that appears truly amazing to the uninitiated. The preheating torches are shut off, and the weld, still glowing in part, is quenched with compressed air. This unusual way of testing the soundness of welds in cast iron is vouched for at Twin Cities. Any locked-up stresses in the welded casting, it is pointed out, would certainly be brought out by the severe air quench. Hence if the part doesn't recrack, there is no doubt in anyone's mind as to the success of the welding job.

A good block or head is also assured by a thorough postweld checking. This includes a careful inspection to see that there is no other damage which was missed at the first inspection. Before making the postweld inspection, the casting is sandblasted to remove all scale and rust; any cracks missed at first will be clearly brought out by the sandblasting.

If the block or head passes inspection, it is sent to a surface grinder, where warpage caused by preheating or welding is carefully removed. Fig. 4 pictures the two surface grinders with which the Twin Cities shop is equipped. The larger of these, which swings a 24-in. cupped wheel, is used for grinding large blocks and heads. The smaller surface grinder (right in the picture) has an 18-in. cupped wheel and is used on small heads.

This assembly-line set-up enables Twin Cities to turn out from 25 to 30 repaired cylinder heads and blocks per day with four weldors. It can be seen that the available time for welding a head or block is slightly over one hour. Speed of the operation is attributed to "know-how" and to the homemade preheating furnace and homemade preheating torches used during welding.

Adequate machine tools are at hand to machine blocks or heads having insert valve seats. Twin Cities also carries inserts in stock and is equipped to press them into place. The same is true of valve guides.

Many of Mr. Brackett's customers were unable to obtain large-size piston rings of the sets utilized on heavy industrial units and big "Cats." They came to him for help. Having close contact with manufacturers of automotive parts, Brackett decided to become distributor for them in the Omaha area. He also enlarged the services offered by Twin Cities to include the complete repair of all types of engines. He now carries a large stock of parts on hand and not only jobs them but also uses them in his engine repair work.

Additional machine tools had to be purchased so that complete automotive machining might be offered. The shop eventually became fully equipped. Now anything in engine rebuilding from regrinding a crankshaft on up can be and is being done.

This super-duper job welding shop is still a family affair. Mrs. Brackett, who assisted her husband in starting the business, has been right in there pitching ever since. She is in charge of the office and, with the assistance of an auditor, takes care of all the bookkeeping and paper work. Her husband has gotten out of coveralls and is primarily engaged in selling the services of Twin Cities Welding to its many customers all over the United States. When a tough job comes along, however, he is often to be found in the shop, helping out with a welding torch.

It was the freeze of 1940 that put the Bracketts on their feet, but they kept there by their own staying power. Secret of their success, they say, is that they have been able to deliver repair jobs "as good as new," saving customers money while giving them the same service that a new head or block would give. The record of this business proves what can be done in the welding field given hard work and planning, the will to win and the brains to figure out a way.

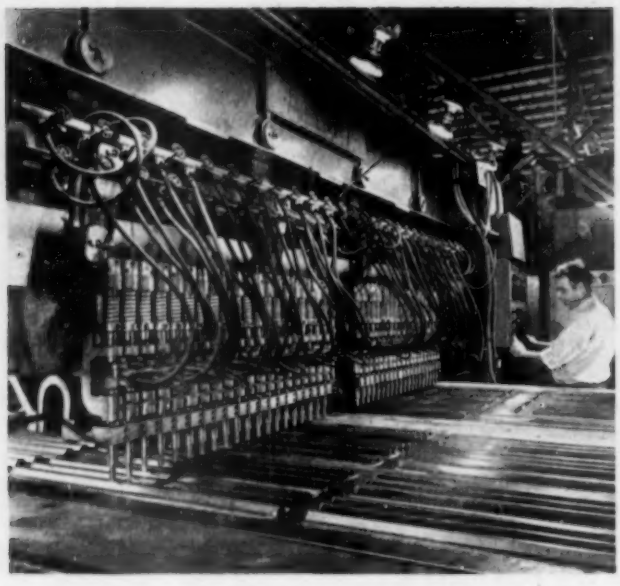


Fig. 13—Multiple spot welder used to weld stiffeners to the side sheets of a railroad car. Table indexes automatically under the row of welding electrodes

Fig. 14—The indexing pattern is set up by removing proper rivets for the two rows of holes along one side of the table. Photo-electric control does the rest

Welding Railroad Passenger

A 40-electrode multiple spot welder that indexes automatically and a seam welder driven at a speed varying with the car roof contour are some of the startling developments of resistance-welding processes at Pullman-Standard

BY ARTHUR M. UNGER

Chief Welding Engineer, Pullman-Standard Car Mfg. Co.

The different types of railroad cars and the many different parts of each car require the joining together of a variety of metals, necessitating the use of all types of welding processes and equipment. In last month's installment of this two-part article, Mr. Unger told how the various components of the structural underframe are fabricated. The present installment takes up the three other major subassemblies—sides, ends and roof. For these, the utmost ingenuity is utilized in the design of fixtures and special resistance-welding equipment.—THE EDITORS.

THE side sheet of a car side is divided into approximately 16 sections by one horizontal seam, running the full length of the side midway between top and bottom, and seven vertical seams. The building of a side sheet begins in the steel mill, where the individual sheets are inspected for flatness. A close tolerance is held to insure a smooth flat car side.

The first manufacturing operation is to shear the sheets to size and cope out window openings. Next corrugated stiffeners are spot welded to the side sheets in order to prevent them from buckling. The attachment of stiffeners to the side sheets is an important development by Pullman-Standard in producing flat sides for passenger cars. The entire area of the side (except clearances for the attachment of framing members) is covered with corrugated stiffeners, which prevent any distortion or buckling of the side sheets.

The attachment of these stiffeners involves a considerable amount of spot welding, and a very interesting automatic welder was developed to do this work. The machine has so many unusual features that it will be described in detail.

MULTIPLE SPOT WELDING

The automatic multiple spot welder developed by Pullman-Standard for welding of the side sheet stiffeners is illustrated on the front cover. This machine, the largest of its type in the world, consists essentially of a large table top covered with a ½-in. plate of solid copper to serve as a back-up for the row of 40 electrodes shown in Fig. 13. The sheets, with the stiffeners attached in proper location by spot tacks, are laid on the table, which indexes automatically under the row of welding electrodes. The stiffeners are thus welded on while the sheets are lying perfectly flat on the copper plate.

This welder utilizes the series welding principle. Two electrodes are in series, with the copper plate underneath the work serving as a back-up to conduct the welding cur-

Fig. 15—After the stiffeners have been welded to the side sheets, submerged-melt welding equipment is used to join the sheet sections into a full-sized car side

Fig. 16—The sheets lie flat until they have been welded together. The table is then tilted for transportation of the entire car side to the framing jig

Cars—II

rent, and each pair of electrodes has a separate welding transformer. Spacing between the electrodes is adjustable, and each electrode also has an individual pressure adjustment by means of springs. All of the electrodes are mounted on a ram, the vertical movement of which is toggle-operated by means of hydraulic cylinders. Provision is made both for a normal operating stroke and for an additional retraction stroke to clear higher objects. The table is made twice the length required for the work so that one end can be loaded and unloaded while welding is taking place on the other end.

The most novel feature of this machine is its automatic indexing and movement of the table. Indexing is accomplished by means of photo-tube relays. The light sources and photo-tubes are mounted near one side of the table so that they may be controlled by an indexing pattern.

Fig. 14 shows the indexing pattern being set up. Two rows of holes running the full length of the table are placed so as to pass between the photo-tubes and light source. All holes are filled with loose rivets, preventing light from passing through.

Fig. 18—The side spot welder makes two welds at a time and travels in either a horizontal or a vertical direction over the vertical car side

Fig. 19—Jig and seam-welding head for the car roof. The track carrying the welding head is shaped to conform to the roof curvature

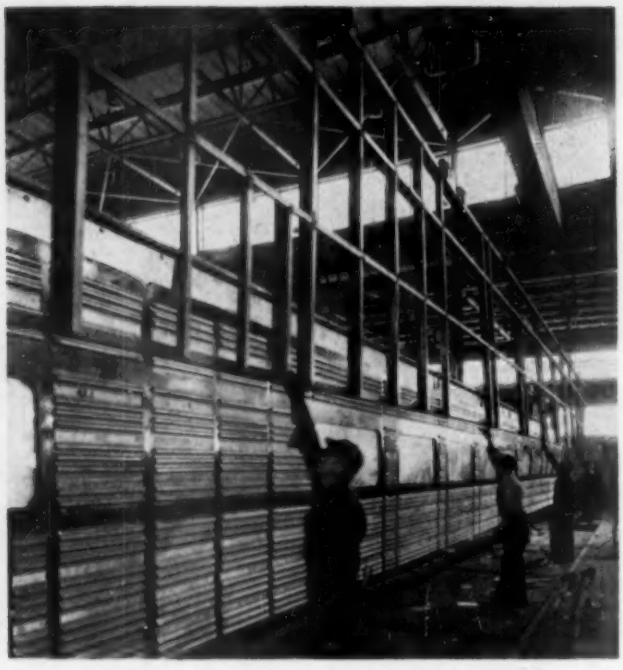


Fig. 17—A ½-in. copper back-up plate, 8½ ft high by 85 ft long, permits framing to be spot welded to the side sheet (Fig. 16) over the entire car side

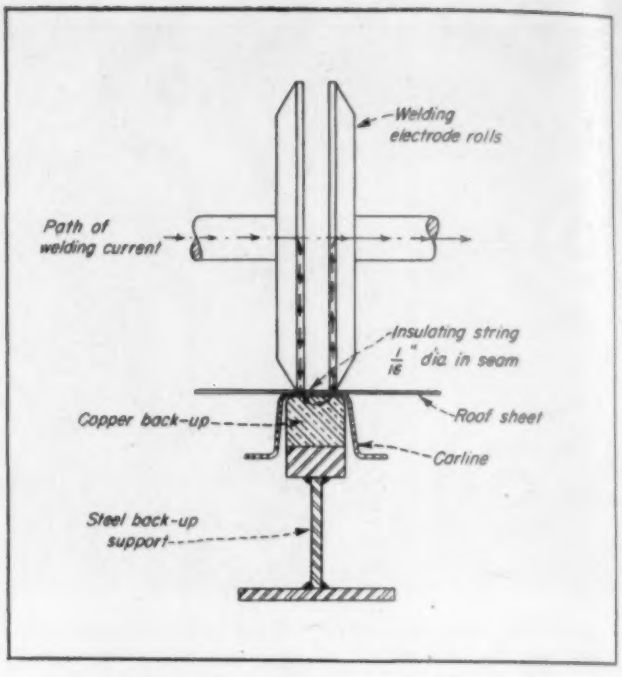


Fig. 20—This schematic diagram illustrates the welding of the roof sheet to the carlines or transverse supporting members. Two seams are welded at a time

When a rivet is pulled out of a particular hole, the light admitted operates the photo-tube relay to make a weld in the corresponding position. Any desired pattern of spots can thus be easily set up.

The second row of holes controls retraction of the electrodes. By selecting the proper rivet to pull out of the hole, the electrodes can be made to retract in any desired position. The table is automatically controlled so that it will, if desired, move to the center upon finishing the work on one end and start welding on the work that has been loaded on the other end.

Submerged-Melt Welding

After the corrugated stiffeners have been welded to the side sheets, the next operation is to join these sections together to form one large sheet that extends the full height and length of the car side. Joining of the side sheet sections is an interesting application of submerged-melt arc welding. The side sheets are of 14-gauge (0.075 in.) thickness, and the joint is a flush butt joint. First the horizontal seam is welded, and then these units are joined together by vertical seams.

The equipment used to do this welding may be seen in Fig. 15. The track for the welding head carriage is mounted upon a stationary fixture, and the sheets are moved underneath this fixture from seam to seam. The table top is covered with rollers so that the sheet moves freely. After the last vertical seam is completed, the sheet lies full length on the table. The table is then tilted, as shown in Fig. 16. From the tilted position, the side sheet is picked up by a boom and transported to the side spot-welding jig.

Side Framing to Side Sheet

Fig. 17 shows the side sheet in place against the copper back-up of the side spot-welding fixture. This ½-in. copper back supports the entire car side and permits welding pressure to be applied to any point desired over an area 8½ ft. high by 85 ft. long. In the illustration, the side framing is being lowered for assembly against the side sheet.

Spot welding of the side framing to the side sheet is performed on a vertical jig for several reasons, the most important of which are:

1. Distance is a minimum from the eyes of the operator to all parts of the work.
2. Shop dust and dirt are prevented from settling on the copper back-up plate.
3. The cooling water runs off freely.
4. The side is in its natural position.
5. Less floor space is occupied in the shop.

Automatic Indexing

The automatic side spot welder, Fig. 18, has two welding electrodes that make a series weld. These electrodes, along with the transformer unit and air cylinders, are indexed automatically in either horizontal or vertical direction as desired. To weld the horizontal members of the framing to the side sheets, the welding unit is rotated 90 deg from its vertical direction of travel. When welding horizontal rows, the entire machine indexes along the track on which it is mounted.

Indexing is accomplished by means of a motor, which is started and stopped for each index and is especially designed for frequent starting. The length of time that the motor runs is governed by an electronic sequence panel, and spacing of the spots is controlled by turning a timing dial. A plugging relay gives quick braking for the motor and accurate spacing. On his comprehensive control panel, the operator has available all the necessary dials and instruments to adjust welds and indexing.

Welding current controls for the side machines are mounted on an overhead balcony. Four complete sets of controls are provided, and

Fig. 21—Another view of the roof jig, showing how a complete roof is fitted up before the seam-welding head (pictured in Fig. 19) is brought into play

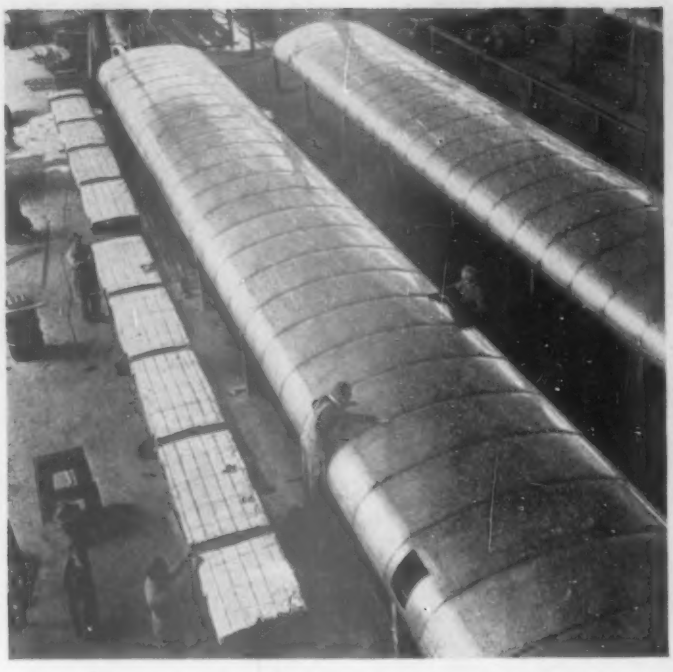


Fig. 22—The seam-welded roof is removed from the jig and set upon supports while the welds are inspected. The roof is also painted inside and insulated

plugs are so arranged that any one of three side machines can be plugged into any one of four controls. This gives a very flexible arrangement. The controls connect with the side machines through cables that utilize a counterbalanced sheave carriage to take up the slack. There are two sets of cables on each side of the jig so that two side machines can be worked on one side if desired, or a spare set of cables provided when only one machine is being used on a side, as is the plan for normal production.

The controls are fully synchronous and give exact weld timing. A current compensator type of control is used to maintain constant current, and this has been found to give excellent results in weld consistency.

Seam Welding Roofs

Roofs for the railroad passenger cars are welded by the machine and jig shown in Fig. 19. This Pullman-Standard-design machine has roller electrodes mounted on a carriage traversing the entire width of the roof. The track for the tranverse movement is shaped to conform with roof curvature so that welding pressure in all positions is normal to the roof. Two electrode wheels are used side by side, connected in series so as to weld two seams simultaneously, one on each of the two sheets that butt together on the roof carline. The roof carline is supported by a copper back-up bar, which in turn is supported by a steel structure capable of withstanding the pressure of the two welding wheels. Schematic drawing of the device is shown in Fig. 20.

Fig. 21 is a view of the roof jig. A complete roof is fitted up at one time. The carlines or transverse supporting members of the roof are fitted over the copper back-up supports. The electrode wheels roll from one end of the carline to the other, welding the sheets to the carline. The sheets, as the photograph shows, are laid transversely of the roof and are strapped firmly into position to insure that the correct contour is maintained during the welding operation. After each seam is welded, the machine is moved longitudinally to the next seam.

Variable Welding Speeds

Movement of the welding wheels is controlled by the variable-speed d-c motor that drives the welding unit. The welding wheels are idlers, their speed being governed by the speed of the welding unit. This is a direct ratio only when the welding unit is running on a straight track and the welding wheels are on a straight line parallel to the track. The track, however, is not straight but curved, and the roof also has a varying curvature. In order to have constant welding speed at the electrode wheels, it is necessary to vary the speed of the driving motor. This is accomplished in an ingenious fashion.

Power for the driving motor is obtained from a motor-generator set. The voltage supplied to the driving motor is varied by means of a rheostat in series with the shunt field of the d-c generator of the motor-generator set. The rheostat is mounted on the welding unit and is operated by a cam track placed along the supporting track of the welding unit. By proper location of the cam track, it is possible to have constant speed at the welding wheels. This, however, is not desirable since at certain positions on the roof the welding speed should be changed to compensate for the variation in contact area of the welding wheels to the work because of different radii of curvature. The top of the roof, for example, has a much larger radius than the sides; therefore more of the roof sheet is in contact with the welding wheel. It is necessary to speed up the welding wheel on that portion of the roof with the smaller radius in order to avoid overheating due to the higher concentration of welding current. The cam track previously mentioned is arranged to do this,

(Please turn to page 43)

Milt Sims, owner of Absco Welding Supplies, and Charles De Long (below), his first employee and Exposition Blvd. store manager

Mateo St. store in the industrial district of downtown Los Angeles

Fast Service,

Milt Sims operates from three points at once, diversifies his lines of products, has eight truck drivers who also serve as city salesmen

BY HENRY W. YOUNG

IN METROPOLITAN Los Angeles and contiguous territory, a supply house is operating under the name of Absco Welding Equipment and Supplies. It is wholly owned by a man with two good four-letter names—Milt Sims. Apparently there is nothing extraordinary about it except that the business shows total annual sales of $600,000. That, however, is enough to place this distributor up in the very front rank of welding equipment and supply houses in Southern California.

Sims started his supply business as recently as 1942, and he prefers to conduct it from several small, strategically located stores rather than from one larger and more pretentious establishment. As to the latter policy, he expects to continue it as the business expands.

THREE SCATTERED SITES

"Almost more than any other type of distribution business, the welding supply business depends on fast service—not simply daily, but frequently several times a day," Mr. Sims explains. The four essentials calling for these frequent deliveries are oxygen, acetylene, carbide and rods. Taken by itself, our annual sales volume is large enough to warrant a pretty good-sized and pretentious establishment, centrally located; if we allowed delusions of grandeur to crowd out common sense, we would probably be tempted to build something like that. The rub is transportation conditions and the bottlenecks of street traffic. I cannot see any sense in fighting our deliveries through an average of 12 to 15 miles each day, with extremes of 30 miles or more.

"The answer, we find, is to do business out of three widely separated warehouse and store units. Each store is under a competent, experienced manager. As our business expands, I expect to follow the same plan by adding more and more store units of modest size but close to the customers, all of them tied together in one central organization."

The headquarters of the company are at 5005 Exposition Blvd., on the west side and not very far from the Hollywood picture industries. Another store is in the industrial district at 582 Mateo St. The third is northeast of Los Angeles at 516 So. Raymond Ave., Pasadena. None of these stores is over 50 by 100 feet. It is interesting to note, however, that the diminutive counter and stock of the Pasadena store (see picture) produce in sales from $4,000 to $4,500 per month. This is about half of the monthly sales of the branch, the other half being made up by

Warehouse, Exposition Blvd. store. R. P. Edwards, warehouse superintendent, is facing toward the camera. Executive offices are at this address

One of the company's eight delivery vehicles is this 1-ton truck

Frequent Deliveries

warehouse deliveries of oxygen, acetylene, carbide and rods.

Before going further, just a little of Sims' background and that of the key men in his organization. Prior to the war, Sims had spent 20 years with the Linde Air Products Co., in sales and service. Ambitious to be on his own, he had been laying plans to found a welding equipment distribution business (then a comparatively new field) and was just about ready to start it when the Japs struck Pearl Harbor.

Started Wartime Shop

Sims revised his program hurriedly. Instead of a supply business, he and his partner started a wartime welding shop and did a really big-time job in that line, particularly in serving the great wartime aircraft industry centering in Los Angeles. When the war ended, Sims was anxious to carry out his former plan for a distribution business. His partner, however, was just as anxious to continue the welding shop. Hence, they separated, the partner buying Sims' interest in the shop.

As the nucleus of his organization, Sims secured the services of Charles De Long, now manager of the Exposition Blvd. store. De Long had been with him in the shop, and before that was with Lockheed for five years as supervisor and inspector of welding. Prior to that he was with Air Reduction Sales Co. for 10 years as sales and service engineer.

Howard Cloyes was persuaded to manage the Pasadena store. Cloyes was with Sims in the war plant, where he served as magnetic-particle inspector and welding expert.

Joseph Schiada is manager at the Mateo St. store. After a period with the U. S. armed services, he joined Absco in 1944. Previous experience in the business had been acquired before the war from eight years with Linde Air Products.

Diversified Merchandise

One of the strong factors in building up the Absco annual sales volume has been a "controlled diversification" of products. Lines have been added outside of welding equipment and the well recognized safety accessories such as helmets, gloves, goggles, etc. These outside lines have been chosen with great care, as items that are most generally called for by the customer when he is discussing his problems with the welding distributor's salesman. All of them have a definite tie-in with welding equipment and supplies. The list of associated items now handled by Absco includes:

Portable electric tools; portable electric grinders and wheels of types used in weld finishing or preparation work; hand tools and drills; shop desks and metal furniture; pneumatic tools; rotary wire brushes; lead and tinning compounds; body solders.

Altogether, these non-welding items will account for approximately 10% of the annual sales volume of all stores. And as time goes on, Sims expects this ratio to be increased for two reasons. One is that the possible business for the distributors of strictly welding and welding accessory lines is not sufficient to enable them to carry on large business operations, as measured by certain other types of distributors. Since it is Sims' intention to grow extensively in magnitude, he needs more things to sell to his customers.

The second reason for diversification is that the welding supply and

Successful Welding Distributor Operations—7

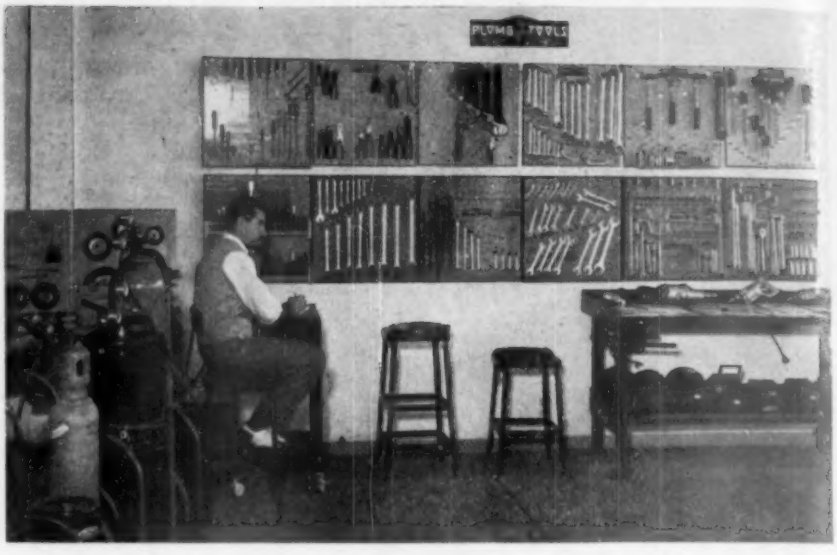
equipment business must be built largely around service. One good way to render service to welding shops and the welding departments of industrial plants and contractors is to obtain for the weldors certain related items that they need in their work, thus enabling them to buy all of their supplies at one place.

Low-Bedded Trucks

The company owns and operates eight delivery trucks. These trucks were designed and built with special streamlined bodies, and they are all constructed along the same plan. The truck beds are all built right on the frames, making them very low. The low beds greatly facilitate loading and unloading of the 150-lb and 250-lb cylinders. The driver, in fact, is able to handle the entire load without the embarrassment of asking customers to assist him in unloading.

Another feature that facilitates cylinder handling is that the cylinders may be stood on end and fastened in place with chain binders. This also makes it possible to carry a large number of cylinders. All of the stakes at the edge of the truck body are removable for the handling of welding machines or other large equipment.

Working out of the three warehouses, the trucks make daily service calls on all large customers throughout the territory for the delivery of oxygen, acetylene, carbide and rods. This type of daily service on the four prime essentials of welding and cutting must necessarily be rendered by the distributor who is to keep pace with the competition.



Among the non-welding lines are hand tools and drills. Displayed with them in this picture is Joseph Schiada, manager of the Mateo St. store

Pasadena store, with Howard Cloyes, manager. This diminutive counter and stock—about 10 by 18 ft—produce sales of $4,000 to $4,500 per month

Truck Sales Force

To render the daily service calls productive of something besides mere goodwill, Sims has organized his truck drivers into an auxiliary sales force—a plan which accounts for no small portion of the daily volume. After delivering the day's orders, the truck salesman first seeks to write the order for the next day's supply of the four staples. Delivery service being what it is, the trade has grown accustomed to ordering from day to day in this way. By taking the order on the spot, the driver insures that he gets the business and saves the customer from having to telephone in the order during the morning rush period.

The driver also carries with him the company's equipment catalog and a supply of manufacturers' literature bearing on the various lines. While naturally his time is limited and he cannot do a really intensive selling job, he does call attention to equipment items frequently, pointing out a need here and a use there and always asking for an order. Since his customers have come to know him intimately through the daily calls, his suggestions and brief selling contacts bear fruit in a surprising number of cases.

The truck sales force is supplemented by four salesmen who cover intensively a territory that includes metropolitan Los Angeles, Santa Monica, the Bay Cities, Alhambra and Pasadena east to El Monte and Azusa. All four of these salesmen have had several years' experience as both practical weldors and service men working for major manufacturers. Hence they all have an expert knowledge of welding processes and are able to assist customers with any special or technically difficult jobs.

These salesmen call regularly on all industrial plants, heavy contractors, welding and machine shops, garages and body shops. In addition, they follow up reported tips from truck salesmen, where special knowledge or the staging of tests or dem-

on-stration of processes is required.

Sims Sells, Too

It is quite proper to count Mr. Sims as one of the outside salesmen. So well are his three store units organized and manned that each is able to stand on its own feet in day-to-day operation. The store on Exposition Blvd. is known as the main office, and here records are kept, invoices made out and perpetual inventory and stock control handled for all units. Yet you will not find Owner Sims tied down to a desk at headquarters and buried in the details of paper work. On an average, he spends one day at each store and then repeats, in rotation. He is also able, after a little supervision at each place, to devote a large share of his time to actual contact with customers, both in the store and in the field.

WELDING PASSENGER CARS

(Continued from page 39)

thereby producing uniform welds throughout the entire roof contour.

The welded roofs are removed from the jig and set on supports as shown in Fig. 22. In this position, the welds are inspected, and the inside of the roof is painted and insulated. Air ducts and exhausts are also installed.

Ends and Inside

Ends for the passenger car, while simple in construction, require the use of several different welding processes. Spot welding is used to attach stiffeners to the end sheets. The anti-telescoping plate is mainly of spot-welded construction. Diaphragm and posts, which are part of the end structure, are strength members specially designed for collision requirements. Oxy-acetylene cutting is used to trim the ends to the desired shape. A reinforcing doubler plate is submerged-melt welded to the web of the I-beam post with the automatic equipment suspended on the gantry frame described and pictured in the discussion on underframe parts.* Manual arc welding is used to join the ends of stiffeners to sills, ceiling plates, etc.

*"Welding Railroad Passenger Cars—I," page 44, The Welding Engineer, October, 1947.

A 3½-ton delivery truck. The low bed greatly facilitates the loading and unloading of heavy cylinders. Stakes at sides and end can be removed

The term "inside finish" is used to cover the large variety of parts that go to make up the inside of a car. It includes partitions, lockers, cabinets, ventilating ducts, beds, bed recesses, wash stands, tables, racks, kitchen fixtures, doors and a multitude of others. Welding again is an indispensable tool in the fabrication of these items. Aluminum is a very popular material for inside finish. Stainless and Monel are used extensively. The welding engineer is called upon to prescribe the proper procedures for all of these various materials in their several different forms.

Spot welding is used quite extensively for interior car parts. When a machine is used exclusively to weld aluminum, it is of the stored-energy type. However, most of our spot welders are required to weld a variety of materials, for which an a-c type of machine is preferred. Most machines are of the pedestal type, but large lockers, cabinets and beds necessitate the use of rocker-arm spot welders. Portable welding guns are used to great advantage when the quantity of the item to be produced justifies setting up of a regular production line. Doors are one example.

Oxy-hydrogen welding is used considerably on aluminum. Manual arc welding of aluminum parts is also used quite extensively.

Much use is made of gas equipment for cutting and brazing. Oxy-acetylene cutting is a useful process in the fabrication of car parts. The underframe, which has most of the heavier thicknesses, has many parts that are cut to shape by the gas torch. An example is the draft sill cover plates, which are automatically cut to shape by a flame-cutting machine. Manual cutting torches are extremely useful in fitting operations.

Installation of air conditioning equipment on the car requires the use of brazing equipment for silver soldering of the copper tubing connections. Similar methods are used on other piping systems.

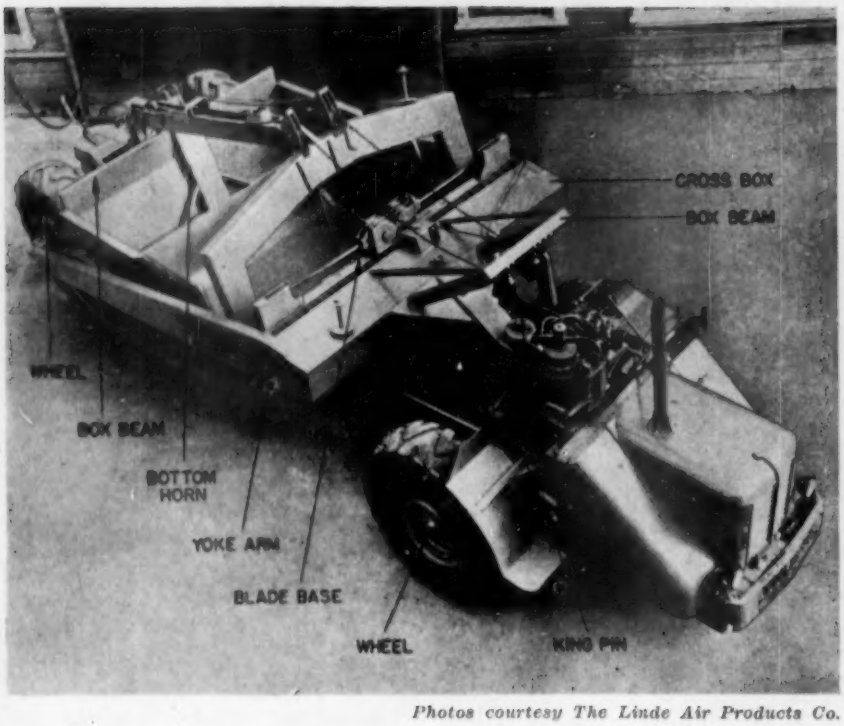
Resistance brazing is found to be useful in the manufacture of some parts; for example, cast coat hooks are brazed on to mounting plates. An old foot-operated spot welder was converted to a brazing machine by substituting carbon blocks for the electrodes. The work to be brazed is clamped between these carbon blocks, which are heated to red heat by the high current. The heat is then passed by conduction to the part being brazed.

All in all, the building of today's railroad passenger cars would be very difficult and inefficient without the many types of welding equipment and procedures that are available to the car builder.

☆ ☆

Sutton-Garten to Expand Fort Wayne Branch

In order to take better care of its customers, Sutton-Garten Co., Indianapolis, has begun construction of a new addition to its Fort Wayne district branch. The company distributes a full line of arc and gas welding supplies, equipment and accessories.



Photos courtesy The Linde Air Products Co.

Fig. 2—Close-up of the "Terra Cobra," showing location of the box beam, yoke arms, grader blade base and other components described in the text

Fig. 3—A portable machine flame-cuts discs for the wheels from 3/8-in. plate and also cuts out the centers

Mechanized Production

By designing the "Terra Cobra" heavy-duty earth scraper for mechanized welding and cutting, this manufacturer reaps the benefits of lower costs and greater production

THE Wooldridge Manufacturing Company, Sunnyvale, Calif., makes a complete line of heavy-duty earth-moving equipment, the star of which is the "Terra Cobra" heavy-duty self-propelled scraper. The line also includes a series of tractor-drawn "Terra Clipper" scrapers and bulldozers.

The Terra Cobra scraper is a self-loading unit that carries 18 cu yd of material for long distances at a speed of 21 miles per hour and spreads it at the point of discharge. Hard ground, frozen ground or ground containing large rocks or partially decomposed granite are a few of the conditions encountered that call for the most sturdy construction.

Redesigned for Welding

Welding is the most practicable method of fabrication for this type of equipment, and our entire line has been redesigned for the maximum use of mechanized welding and cutting. The benefits obtained, particularly lower manufacturing costs, are well worth the effort of redesigning the component parts for welded fabrication.

As many parts as possible have been designed for manufacture from flame-cut steel plate or simple rolled shapes by mechanized welding. The shipbuilder's secret of welded sub-assemblies joined by welding in the final assembly has been used to the limit.

The tractor-unit frame assembly for the Terra Cobra scraper is a good example of fabricated sub-assemblies welded into one rigid complex unit. This frame with some of the auxiliaries in place can be seen in the view of the tractor-unit assembly line, Fig. 1.

It is hardly necessary to add that adequate jigs, fixtures and positioners are required for maximum efficiency in the welding operations. Several such jigs will be shown in the accompanying illustrations.

The submerged-melt welding process is used extensively in the fabrication of subassemblies for various pieces of equipment. These sub-assemblies are then joined by manual arc welding to make the completed assemblies. Oxy-acetylene cutting is also an important fabrication tool since the accuracy obtained with this process permits close fit-up and thereby reduces shrinkage stresses and minimizes warpage.

Manual flame-cutting is used for small parts and trimming for fit-up. Mechanized shape-cutting is used to form dozens of different pieces. Two stationary oxy-acetylene shape-cutting machines and 15 portable cutting machines are used as well as a number of hand-cutting torches. A crew of 29 men, including a shear man and two shear helpers, processes 25 tons of steel sheet and

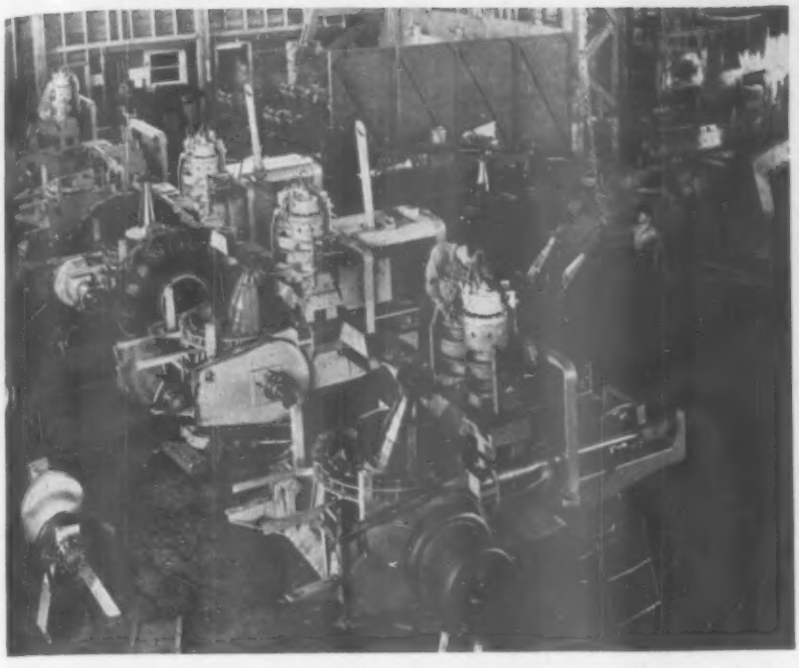


Fig. 1—Tractor-unit assembly line for the Terra Cobra scraper. Mechanized welding and cutting are indispensable adjuncts to the fabrication of this earth mover at the Wooldridge Manufacturing Company

Fig. 5—Flange ring bases are welded, a number at a time, by a submerged-melt head and are afterwards knocked apart

Boosts Scraper Output

BY EARL GRIFFETH

Plant Superintendent, Wooldridge Mfg. Co.

shapes per eight-hour shift, cutting over 80% of this material by the oxy-acetylene process. About 15% of the steel processed is scrap material.

Discussion of the fabrication of typical subassemblies will best illustrate how mechanized welding and cutting are being used. Fig. 2 shows the Terra Cobra scraper and indicates some of the parts which are produced by these methods. Some of these will be discussed in detail.

Drive Wheel Assembly

An interesting subassembly is a main drive wheel for the tractor unit of the Terra Cobra scraper. These wheels are so nearly complete after welding that the only finishing necessary is the boring of the hub for bearing cups and drilling of the flange for the sprocket gear. In all, 24 different types of wheels are manufactured from shape-cut steel plate. Tack welds are made manually, while the finish welding is done by the submerged-melt process.

Wheel fabrication begins with the cutting of discs from ⅜-in. steel plate. This operation is performed with a portable cutting machine, which is also used to cut out the centers to form steel rings as shown in Fig. 3. These particular discs are 25⅝ in. in diameter with center holes of 8¼-in. diameter.

Tire flanges are cut out two at a time on a shape-cutting machine. The blanks are pressed to shape in the forge shop and returned to the shape-cutting machine for a final trimming to correct OD.

Illustrated in Fig. 4 are the various flame-cut components that go into a welded wheel and hub. In the left foreground is a tire flange, while in the right foreground you can see one of the wheel discs. A welded and machined flange ring base rests on the disc.

The flange ring bases are production welded by a novel use of the submerged-melt welding process. First, 1 by 2½ in. flat bars are rolled to rings of the desired diameter and the edges are beveled for vee joints. The rings are then strung flush together side by side over a copper chill bar, as shown in Fig. 5. One manual weld pass ties the group into a single piece and forms a backing for the final two-pass automatic welding. The rings are then broken apart and machined to their finished dimensions.

To trim the hub subassembly, the hub is set over a cone centering device. Another cone is set on top to provide a table for the traction wheel which rotates the torch. The drive unit itself is adapted from a portable cutting machine. The wheel and cutting torch are mounted on a turntable so that the entire set-up can be rotated and thus avoid twisting of the oxygen and acetylene hoses.

Another submerged-melt operation on the wheels is shown in Fig. 6. Here a compressed-air-operated welding head is mounted on an adjustable boom. The wheel itself is mounted in a welding positioner and is rotated under the stationary head. One man turns out from 10 to 12 wheels per 8-hour shift with this installation.

The grader blade base makes use

of flame-cut steel and welded fabrication. It may be seen from the sketches, Fig. 7, that the blade base proper is made from 1-in. plate stiffened with a piece of ⅝-in. plate and a spit 10-in. H-beam. Details of the beam-splitting operation are shown in Fig. 8. Directly to the right of the cutting flames may be seen two spacers made of steel plate. Several of these spacers are dropped over the beam to prevent warpage as the cutting progresses. The beams are allowed to cool with the spacers in place. As in all shape-cutting operations at the Wooldridge plant, the machine is guided by a magnetic tracer.

In the actual welding of the blade base, the submerged-melt welding head is mounted on a cutting-machine carriage, and the melt is retained at the weld zone by an asbestos-lined wood retainer clamped to the steel plate. The blade base is suspended between two tripod supports by forks inserted into the ends of the base. The work can be rotated and locked in position for making the successive welds.

Advantage is taken of the natural weld distortion to produce the parabolic curve on the leading edge of the blade base. Because this member is automatically welded and the speed and current values are the same on successive bases, the distortion is also the same. This makes it necessary to set only about 1 out of 50 bases.

After the blade base is welded, the leading edge is beveled on the same set-up by a portable straight-line cutting machine. The bevel is not straight but has a predetermined parabolic curve. The track bent to the necessary arc guides the machine to make this curve.

Yoke Arms Box Beams

The pulling power of the engine is transmitted to the scraper by means of two yoke arms, one on each side. These yoke arms are essentially box beams made of ½-in. side plates, flame-cut to shape, and ¼-in. flat bars. They are fabricated by a submerged-melt weld at each of four corners. All the elements of a submerged-melt installation are visible in the picture of this welding operation, Fig. 9. In the left background are the motor-generator sets and in front of them the welding head is

Fig. 6—Mounted on a welding positioner, the wheel is rotated under the stationary submerged-melt head, which is mounted on an adjustable boom

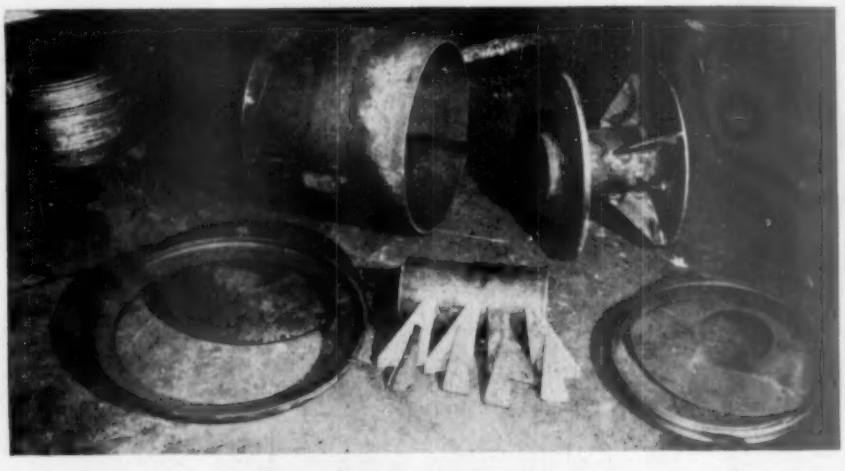


Fig. 4—Wheel-and-hub components. In left foreground is a tire flange, in the right foreground a wheel disc with flange ring base resting on it

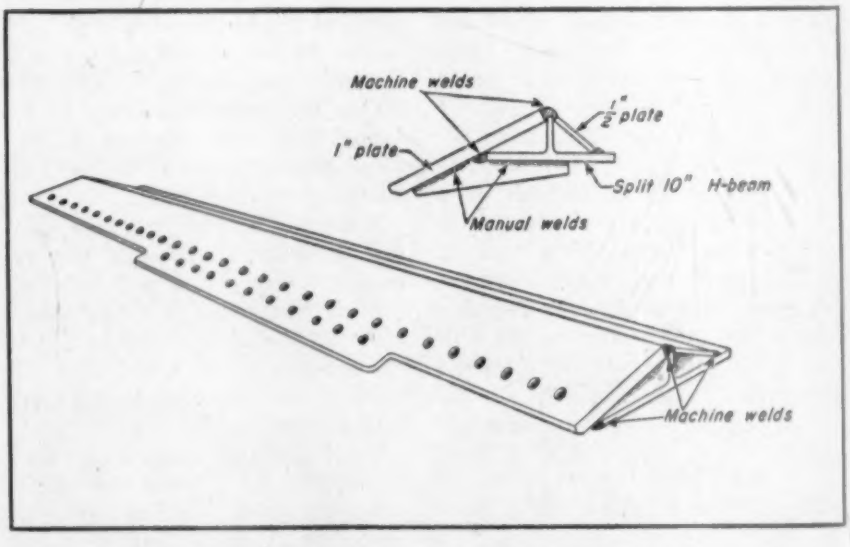


Fig. 7—The grader blade base makes good use of welded fabrication. These sketches show the location of the various manual and automatic welds

Fig. 12—The box beam is fabricated by joining the legs of two angles by means of corner welds. Note the wooden retainers for the granular melt

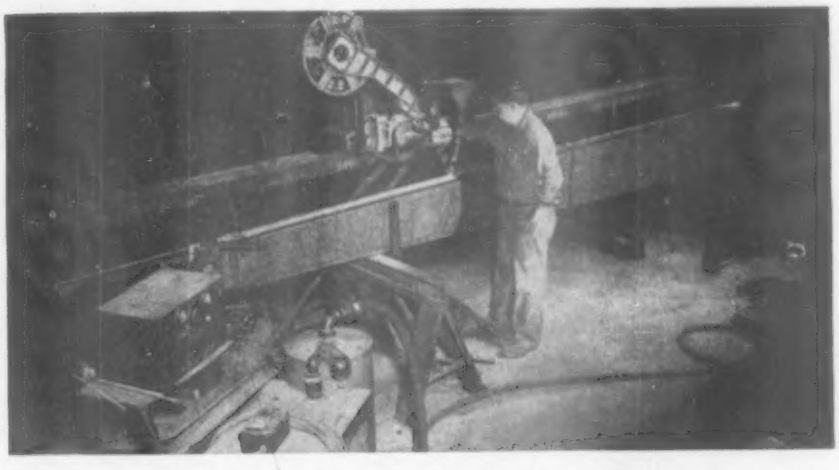


Fig. 9—Fabrication of yoke arms is also largely handled by submerged-melt welding. The yoke arms are box beams, located one on each side

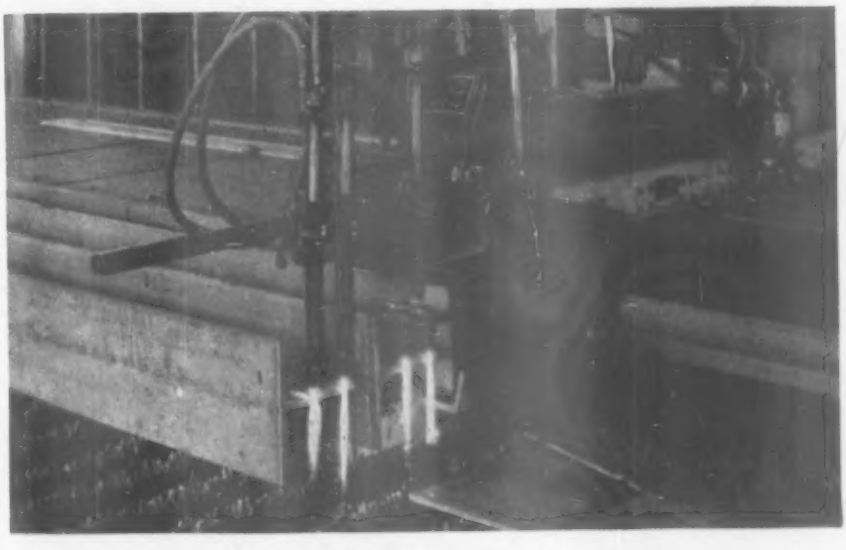


Fig. 8—Splitting H-beams to use in the grader base. Two beams are cut at a time, making four members. Note steel spacers used to prevent warpage

mounted on a cutting machine carriage operating on a straight track. The parts of the weldment are held in a jig parallel to the machine track. The control box for the welding head is in the left foreground, and in front of that is the vacuum melt-recovery unit.

These yoke arms are incorporated into the final assembly, as shown in Fig. 2. The jig for final assembly integrates four subassemblies—the two yoke arms, a head cross box beam and the vertical hub. The vertical hub casting is about the only item in these assemblies that is not a fabricated steel part, and even it has "ears" made from flame-cut steel plate.

King Pin Housing

The scraper is connected to its two-wheeled tractor unit by means of a king pin operating in the vertical hub. Universal motion is obtained by a rocker connection between the king pin and the frame of the tractor unit.

The king pin rocker joint is supported by two fabricated structural members, as shown in the foreground of Fig. 10. These parts are cut from ¾-in. plate and are fitted, cross-braced and tack-welded at another station. They are then placed on a small rotating positioner while four corner welds are made with a submerged-melt head.

A light wooden frame lined with asbestos rope retains the melt on the corner being welded. Each weld is made in a single pass, using a current of about 700 amp, d-c, and 36 volts at a welding speed of 6 in. per minute. The joints are prepared with approximately 3/16-in. overlap at the corner and have a manual backing head.

The king pin itself is forged from 4140 steel and welded to a mild-steel bearing plate 3 in. thick. The principal purpose of this bearing plate is to provide mild steel for good weldability in attaching the ears through which the rocker pin passes. Before welding, the parts are rough machined for joint preparation. The bearing ring and pin are then pressed together and preheated in a furnace at 400 F.

The assembly is placed in a fixture mounted on a motor-driven positioner to permit rotation (Fig. 11). The same fixture is used for

making welds on the other side in accordance with a predetermined sequence. About 45 minutes are required to complete the welding, which is again done with a submerged-melt head.

The box beam shown in Fig. 12 is manufactured from two angles by corner welds joining the legs. This particular illustration is interesting because it shows in detail the melt retainers. These are made of strips of wood faced with asbestos rope and are held in place by wedges and clips tack-welded to the beam.

Straight-Line Flow

The remarkable records made by some of the shipyards during the war can be largely attributed to the fact that these yards were laid out for welded ship fabrication instead of merely being adapted to that purpose, as was the case with some of the already established yards. The flow of raw materials to subassembly points and of the subassemblies to the final assembly station is as important in a manufacturing plant as it is in a shipyard, and it is one of the principal factors in effecting the efficiency of the operation. Wherever possible, straight-line flow with a minimum of backtracking has been provided for at the Wooldridge plant.

The material stockpile just outside the plant includes tubes, channels, H-beams, steel shapes and sheet steel. All of this material progresses from the stockpile to the shears cutting table. When sheared, some of the sheet parts are formed by a large press just back of the shear. In addition to the two large oxy-acetylene shape-cutting machines which have been previously pictured, portable cutting machines are used at strategical points throughout the plant.

An important factor in the efficiency of mechanized cutting operations is an adequate and convenient supply of the two gases. Acetylene is produced by two 300-lb. generators and is delivered by a pipe line to stations throughout the plant. Oxygen is supplied from an oxygen storage unit.

Fifteen tons of steel are used in the manufacture of a Terra Cobra scraper, and about 1,500 man-hours are required for the processing of this steel. An approximate distribution of this labor would be: cutting and shearing 8%; forming 2%; fitting 1.5%; welding 44%; machine work 23%; assembly 20%. Each unit requires 1,352.6 linear feet of oxy-acetylene cutting, 1,054.8 linear feet of manual arc welding, and 327.6 linear feet of submerged-melt automatic welding.

Fig. 10—Welding the supporting members which uphold the king pin housing. A rotating positioner assists in making the four corner welds

Fig. 11—The forged king pin is submerged-melt welded to a mild-steel bearing plate. The parts are pressed together and preheated before welding

Fig. 1—Welding the rolled sheet-steel screw to the shaft. Right end of shaft rests in a U-shaped device that has been mounted on a post for easy turning

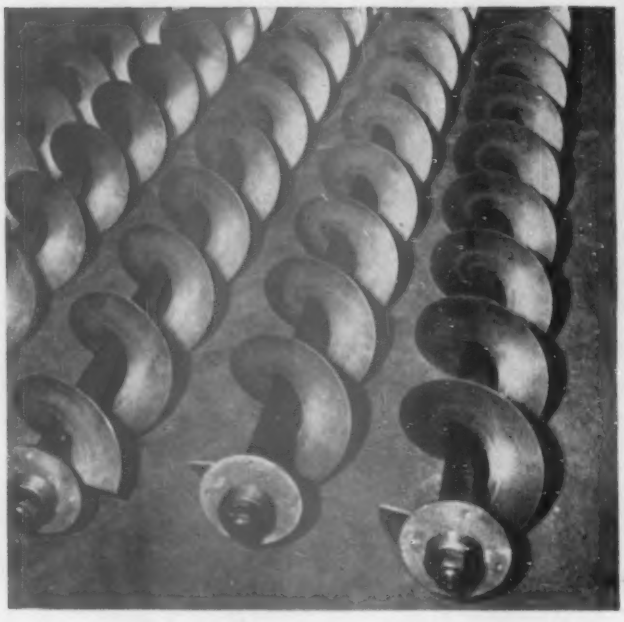


Fig. 2—The sheet-steel screws are purchased rolled to the proper shape and assembled on the shafts prior to welding. These assemblies are ready to be welded

All-Welded Grain Loader

Durability and design simplification are features of a new lightweight portable grain loader being produced by welding

★ PRODUCTION

Photos courtesy The Lincoln Electric Co.

Fig. 3—Four welded braces connect the bearing at the end of the shaft

A GRAIN LOADER is used for the transfer of grain from the ground to trucks, from trucks to bins, from bins to trucks or from trucks to feed bunks. Hence it must be versatile in its operation and durable in its construction. With the aid of welding, The Snow Corp., Omaha, is manufacturing a lightweight portable loader that is capable of unloading grain at the rate of 600 bushels per hour.

CONSTRUCTION PRINCIPLES

This loader is of the screw conveyor or auger type. A motor-driven shaft rotates inside a 6-in. seamless tube. The auger or screw part is formed of 1/16-in. sheet steel welded around the shaft, as shown in Fig. 1. The steel is purchased already rolled and ready for welding. In Fig. 2 can be seen screw conveyor shafts assembled for welding.

To weld the assembled screw to the shaft, a pipe is inserted into the ground and topped with a U-shaped holder in which the end of the shaft can be rested. The supporting pipe is just visible at the extreme right of Fig. 1.

The encasing tubes for the shafts come in 10-ft sections. By welding sections together, loaders of any desired length can be fabricated. The use of aluminum castings keeps the weight of the standard grain loader down to 150 lb.

The shaft is attached by a series of pulleys to a small gasoline or electric motor. The motor is mounted on an adjustable platform that is bracketed to the tube. The bottom of the shaft or nose piece is set in a sleeve bearing having an oil groove for lubrication. The nose piece is the section placed into the grain and is the only point of the completed loader at which the spiral is visible. Four braces are welded from the end of the nose piece to the bottom of the tube (Fig. 3) to connect the bearing.

Because of the success of this type of loader in meeting a variety of situations, The Snow Corp. is experimenting with a 10-in. all-welded loader. This larger model will be able to load and unload coal.

Fig. 1—Complete equipment for atomic-hydrogen arc welding. Operator is provided with convenient means of controlling the arc and welding current. The hydrogen cylinder is fitted with a pressure regulator

Fig. 2—The horseshoe-shaped atomic-hydrogen "fan." Heat is greatest at the center, less intense at both edges

★ OPERATION

Gas-Shielded Arc P

BY L. G. PICKHAVER
Welding Engineer,
General Electric Co.

ALL three of the gas-shielded, arc-welding processes were conceived at about the same time by scientists working independently of each other. Since hydrogen is somewhat easier to obtain than either helium or argon, atomic-hydrogen arc welding has become the best known and most widely used gas-shielded arc-welding process. However, the increasing interest in the helium and argon processes indicates that in the future they may approach the position now occupied by atomic-hydrogen welding.

The helium and argon processes differ from atomic-hydrogen arc welding in two important respects: (1) the arc is maintained between an electrode and the work instead of between two electrodes and (2) the gas acts only as a shield, not as a carrier of heat from the arc to the work. These basic differences permit an obvious division of the gas-shielded methods into two classes: atomic-hydrogen arc welding and inert-arc welding.

The equipment needed for a simple manual installation of atomic-hydrogen welding is shown in Fig. 1. The welder is an a-c transformer of sufficient open-circuit voltage to permit easy starting and maintenance of the arc. The arc voltage is higher than in metal-arc or inert-arc welding; it may, in fact, run as high as 90 or 100 volts.

Welding current is controlled by means of high-reactance movable coils. The greater the distance between coils, the greater the leakage flux and hence the lower the output. Conversely, when the coils are close together the leakage flux is small and the output high. In the welder shown in Fig. 1, the primary coil is moved with respect to the secondary coil by means of a screw connected to a hand wheel. There is an infinite number of coil positions to provide a continuous current range from minimum to maximum output.

Capacitors mounted in the transformer case improve the power factor to the extent that the primary current demand is reduced by one third, allowing the use of smaller primary line switches, fuses, etc. Contactors are provided to control power and hydrogen to the electrode holder.

The a-c arc is maintained between two tungsten electrodes in an atmosphere of hydrogen. The electrode holder consists of two tubular current-carrying members which serve to conduct hydrogen as well as current. An insulated handle is molded over one end of these tubes. On the other end of each member is mounted a clamp that holds a tungsten electrode and provides a jet of hydrogen which entirely surrounds the electrode. The clamps are arranged to permit the electrodes to converge at an angle of about 60 deg, with the arcing ends meeting in the confluent stream of hydrogen.

One tube contains a flexible loop so connected to a trigger on the handle that the exertion of pressure on the trigger separates the electrodes. Releasing the pressure causes the electrodes to come together. It is thus easy for the opera-

Fig. 7—A fillet weld in electrolytic copper. Many hard-to-weld metals can be joined by the inert-arc process

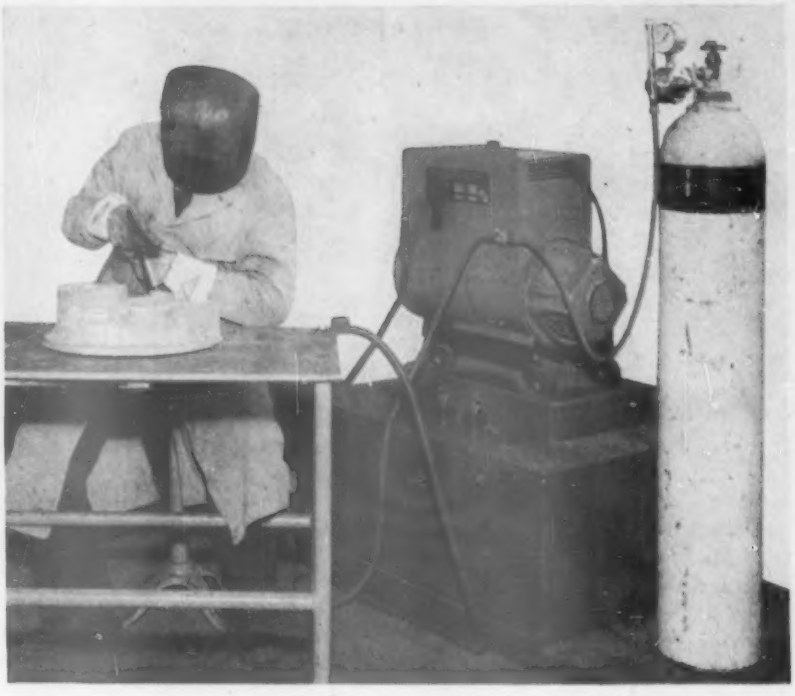


Fig. 4—Manual inert-arc welding requires a welder (d-c or a-c), a cylinder of helium or argon and a holder for the tungsten electrode

c Processes

Useful comparison is made of the advantages and disadvantages of atomic-hydrogen, helium and argon welding

tor to establish and maintain the desired arc length.

A Heat Transfer Process

Unlike other methods of arc welding, the heat of the arc does not come in direct contact with the work but may be said to be transferred from the arc to the work by the hydrogen. As the gas passes through the arc from the jets or orifices around the tungsten electrodes, the molecules of hydrogen separate into their component atoms. As the "atomic" hydrogen thus created is being displaced with molecular hydrogen under a slight pressure, it is forced out of the intense heat of the arc. After leaving the arc, it recombines and in doing so gives up the heat of dissociation. It is this heat that produces the resultant welding temperature.

The arc stream or "fan" (Fig. 2) follows a path similar to a horseshoe suspended by its legs from the electrodes, expanding or contracting as the arc is lengthened or shortened. Ordinarily, a 3/8-in. to 3/4-in. fan produced by a 50- to 90-volt arc is used. This arc makes a singing noise. A "silent arc," a short arc ranging from 20 to 40 volts, is occasionally used to secure a point source of heat.

In studying Fig. 2, bear in mind that the outer edge of the arc stream is the zone of recombination of the atomic gas. Hence a long narrow heat source may be produced by means of the proper arc length. When the fan is carried vertically and approximately parallel to the line of welding, the heat will be applied over an elongated area of length approximately four times its width. Such a heat source will produce a very narrow weld.

A fortunate characteristic of the arc fan is its semicircular shape. Since the shortest distance between the work and the heat source is at the center, less energy is applied at both ends of the fusion area. When the fan is traveling in a given direction, the forward edge will serve to preheat the work and the trailing edge to postheat and reduce quenching. The postheat also slows up the solidification of the weld metal, allowing entrapped gas to escape.

All of these characteristics lend themselves to seam welding, especially on thin-gauge material. The excess hydrogen also shields the arc and weld metal from oxidation. Even with 100% penetration of 3/16-in. plate, the surface tension of steel has been found sufficient to support the molten pool, particularly when a backing of hydrogen is used. The chilling effect of hydrogen is much less than that of a metallic backing and usually eliminates undesirable porosity or cracks. In addition, the hydrogen backing prevents oxidation on the underside of the weld.

Atomic-hydrogen welds are usually ductile, homogeneous and smooth-surfaced. Since the arc causes no turbulence, there is no spatter and little or no grinding or finishing is required on either the top or underside of the weld.

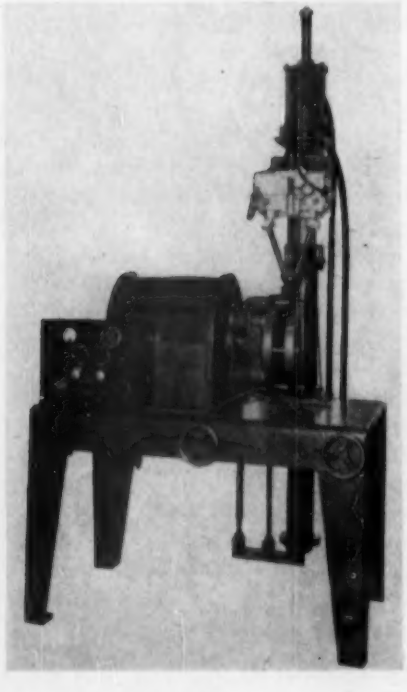
The process is applicable to practically all ferrous and non-ferrous alloys, including the so-called "hard-to-weld" metals. Aluminum is one of the very few metals that require

the use of flux. The process is not recommended for magnesium alloys since the hydrogen causes undesirable porosity. It can be and is being used extensively in the repair or building-up of dies, molds, etc., a decided advantage being that carbon burnout can be controlled. If a filler rod is used that contains 30% more carbon but is otherwise of the same chemical analysis as the work, the deposit will have properties similar to those of the parent metal.

Automatic Atomic-Hydrogen

A seam-welding machine (Fig. 3) has been designed for production welding of tubing and other products fabricated from non-ferrous and ferrous metals by means of circumferential and longitudinal seams. The automatic head is a device in which the electrodes are clamped in carriers connected to a motor through a gear reduction. The motor is controlled by a series of electronic tubes that amplify any change in arc voltage on the motor armature, causing it to feed instantly or withdraw the electrodes and correct the arc length. By eliminating the time lag caused by contactors and other moving parts, the impulse to the driving mechanism is almost simultaneous with the arc changes. Consequently, both a more uniform arc and a more uniform weld are obtained.

Fig. 3—This equipment was designed for the automatic atomic-hydrogen welding of longitudinal seams



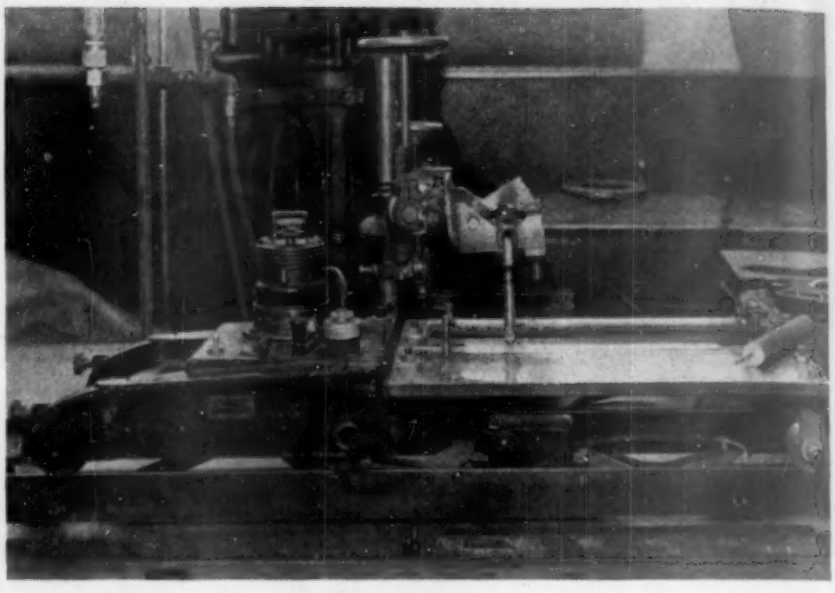


Fig. 6—Semiautomatic apparatus built to investigate the gas-shielded methods of welding aluminum. With argon, a "fixed" electrode is needed

Multiple atomic-hydrogen welders have also been designed. As 150 amp is the maximum welding current which can be satisfactorily used in a single arc, the only solution to increased production on heavy plates is to use more than one arc. A number of arcs may be installed as separate units, or they may be combined in a single multiple-arc welder.

A low-cost source of hydrogen is the ammonia dissociator. The gas produced is 75% hydrogen and 25% nitrogen. No attempt is made to separate them, the nitrogen being introduced with the hydrogen without apparent detrimental effects on the weld.

Inert-Arc Welding

More than 20 years ago, Hobart and Devers working independently of each other in General Electric's Schenectady and Lynn plants, found that helium and argon produced good atmospheres in which to weld with a substantially non-consuming electrode. Nothing much was done with these discoveries because commercial quantities of the two gases were very difficult to obtain. Today helium is plentiful. In fact, because of a surplus of helium, the Bureau of Mines is undertaking the development of new uses for it and is making it available to industry.

A complete set-up for manual inert-arc welding (Fig. 4) consists of a cylinder of argon or helium with a regulator, a welding power source and an electrode holder. A two-stage regulator and flow meter are recommended to make it possible to reproduce at any time the extremely low pressures and gas flows used. The welder may be either a-c or d-c (a standard d-c welder is shown in Fig. 4). The electrode holder is connected to the terminal by a flexible conductor inside the hose supplying the inert gas. There are clamps for five different sizes of electrodes.

Helium and Argon

Our experience indicates that either argon or helium can be used for shielding with excellent results. Approximately double the volume of helium is needed, and yet it is the more economical since the prevailing delivered price is about half that of argon. The arc voltage in helium is about twice that of the arc voltage for a given current level or a given electrode and equipment size. If low currents (less than 50 or 60 amp) are required on thin material (up to 0.030 in.), argon gives a more stable arc.

A typical automatic or machine welder for helium is shown in Fig. 5. The helium cup is directly above the arc, and the tungsten electrode is

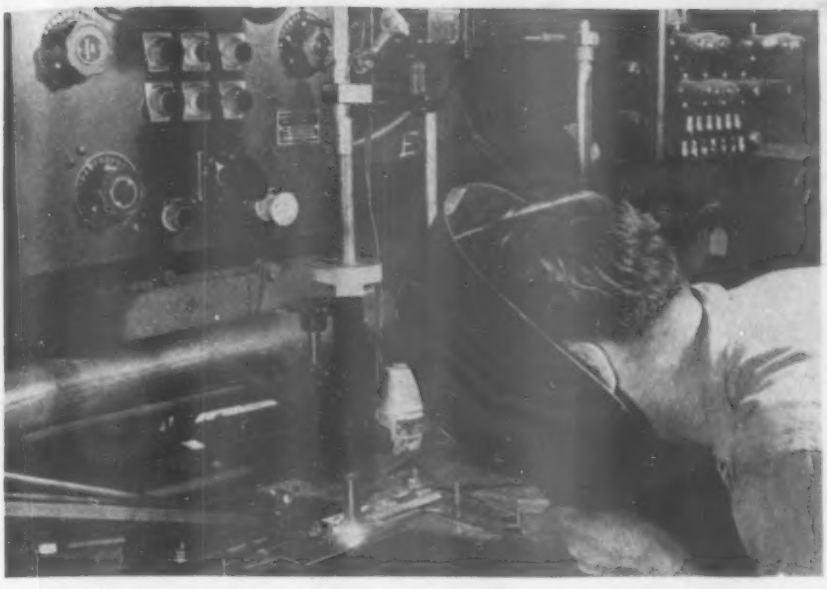


Fig. 5—Mechanized equipment for helium-shielded arc welding. The filler rod is fed automatically from a reel through tube at the left of picture

clamped in a collet contained in the tube which connects the helium cup to an electronically controlled motor. The cup and electrode move upward or downward as a unit in response to slight changes in arc voltage. Filler wire is fed from a reel through a tube into the arc by means of rolls mounted on another gear motor. The speed of the feed motor is accurately regulated. Mounted within convenient reach of the operator are all of the controls necessary to start and stop the equipment, change the arc length and adjust the speeds of travel and filler feed. The operator's station and the thyratron control are very much the same as those used in machine atomic-hydrogen arc welding.

Argon welding introduces difficulties in control. The customary automatic welding head which depends on changes in arc voltage for its control cannot be used successfully to control arc length because the arc voltage in argon is almost a constant throughout the working range of arc lengths. On long straight seams, a fixture with an accurately aligned "fixed" electrode holder will permit a complete joint to be welded without adjustment of the electrode position. For that matter, it would not be difficult to align accurately and space a fixed electrode holder for a circumferential seam on a cylinder.

On some applications, it is necessary to use mechanical means such as cams or rollers to locate accurately the arcing tip of the electrode with respect to the joint.

A developmental "fixed" electrode equipment (Fig. 6) has been used to make some 600 to 700 welds on aluminum and also many welds on other materials. The purpose was to investigate the effect of such factors as gas atmospheres, electrode diameter, current level, power supply and travel speed.

Fluxless Aluminum Welding

The volume of inquiries received by us indicate that the outstanding achievement so far is the welding of aluminum without the use of flux. Several practical applications have evolved from this experimentation. One consists of a corner joint on 2S aluminum. One leg is approximately 0.040 in. thick, the other about 0.080 in. thick; the work is traversed under a fixed gas-shield electrode holder at the rate of approximately 45 in. per minute. Eighty amperes a-c is used with an atmosphere of argon to produce a smooth weld without any trace of flux.

Another outstanding application is the welding of an aluminum cooling and lubricating ring to the body of an aluminum Diesel-engine piston. To meet rigid requirements, flux could not be used. Inert-arc welding with argon did the job and met the exacting specifications.

If flux is not objectionable, aluminum can be welded by either the atomic-hydrogen or the helium-shielded process. From a strictly welding standpoint, atomic-hydrogen arc welding appears to have the advantage in most instances because its high kilowatt output of the arc to the work makes it inherently fast.

Where flux is permissible in aluminum welding, the considerations involved in the making of fixtures and preparing of accurate joints for machine welding may show an advantage in favor of helium-shielded arc welding with flux over both atomic-hydrogen and argon welding. The usual automatic welding head and arc voltage control can be used with helium-shielded equipment. The arc voltage versus arc length characteristic of the arc in helium is very different from that in argon. The voltage changes appreciably with a short change in arc length, and the automatic welding head and control may be used to take care of the variations in arc lengths produced by misalignment or inaccuracy of the welding fixture.

Direct current is preferred as a

(Continued on page 58)

Table I. Heat Output and Control Methods

	Power	Relative Watt Output for Given Current Level	Method of Controlling Arc Voltage on Machine Welding
Atomic-Hydrogen Arc Welding	a-c	8	Voltage*
Helium	a-c d-c	2	Voltage
Argon	a-c d-c	1	Mechanical

(*Requires mechanical maintenance of arc height above work.)

Fig. 3—Trenches 6-ft deep place these pipes well below the frost line. The wrapper protects against corrosion

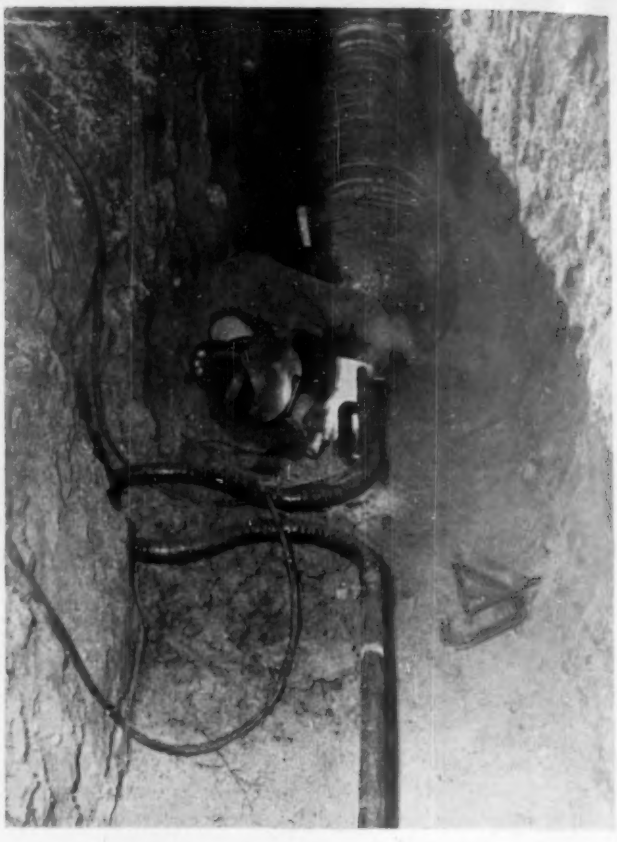


Fig. 5—Completing connection of a snakelike expansion joint. The weldor has to work in cramped quarters

Welding Takes Gas Storage U

When natural gas was stored in underground pipe manifolds at Kankakee, Ill., welding was

Not so long ago a low-flying Army bomber destroyed a 5,000,000-cu-ft gas holder in a Chicago suburb. The Public Service Company of Northern Illinois, which supplies gas service to many Chicago suburbs, came to the conclusion that it could eliminate such risks by storing gas underground rather than in the conventional above-ground holder. Operating and maintenance costs and hazards should also be considerably reduced.

Subsurface Manifold

Result of this thinking was that residents of Kankakee, Ill., are today drawing their natural gas for heating and cooking from a subterranean reservoir installed about a year ago on a 4-acre tract of land. This is the country's first underground gas storage system.

Instead of the usual cylindrical holder or spheroidal tank, the gas is stored in 40-ft. lengths of special 24-in. pipe joined together in a manifold. The sketch, Fig. 1, shows the arrangement for 40 pipe sections having a nominal storage capacity of 1,000,000 standard cu. ft. of gas at a pressure of 2,240 psi.

Before construction could begin, a prototype had to be set up as the information needed could not be obtained from existing oil pipe lines such as the "Big Inch." Questions that had to be answered were: What size of pipe should be used? What kind of steel? How deep should the sections be laid? In what manner or pattern?

After working out the details, the company's engineers found that the storage of gas underground was very practicable. To serve as a test installation, plans were made to build a "pilot plant" capable of holding 1,250,000 cu. ft. of gas. The underground storeroom was to consist of 50 pipe sections, spaced 8 ft apart and laid in trenches 6 ft. deep. The original storage area, Fig. 1, requires five trenches, each containing eight sections, making a total length with manifold connections of about 385 ft. for each ditch. Simple arithmetic shows this layout can take care of only 40 pipe sections; the remaining ten were laid in an adjacent trench just outside the planned storage area.

A torpedo-like seamless tube of molybdenum steel was chosen for housing the gas. This tubing was to have a wall thickness of ½ in. an OD of 24 in. The contract for the 50 sections was awarded to the National Tube Co., a U. S. Steel sub-

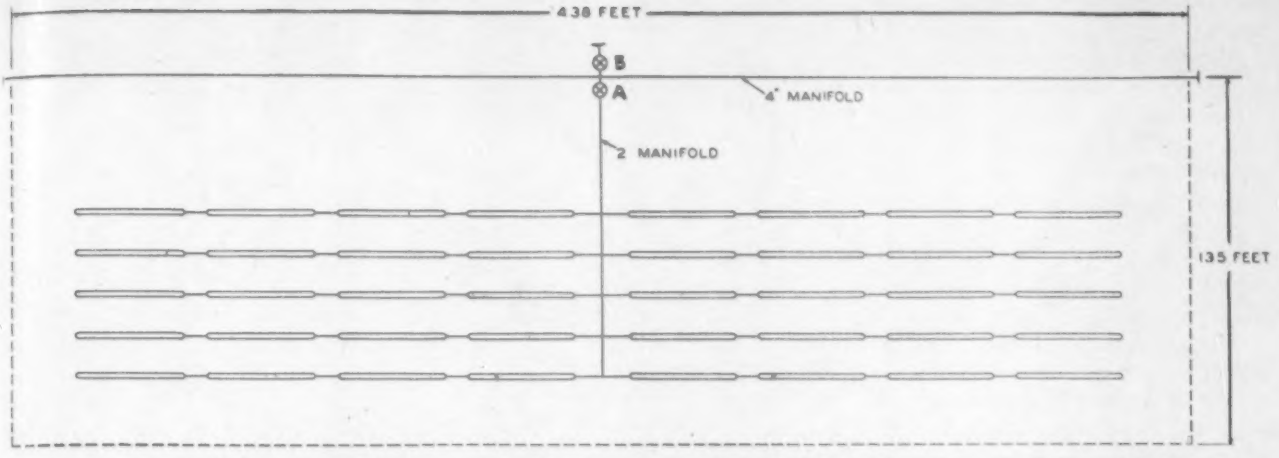


Fig. 1—General plan of the Kankakee storage facilities for natural gas. This layout takes care of forty 40-ft lengths of special 24-in. pipe and gives a nominal storage capacity of 1,000,000 standard cu ft

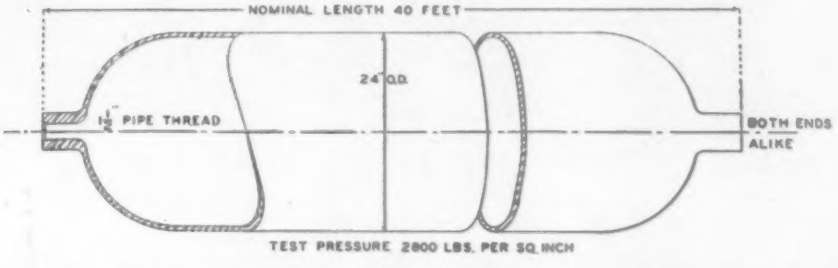


Fig. 2—Plan of a single length of 24-in. OD seamless steel tube. Note how ends have been forged to convert the pipe section into a bull plug

★ CONSTRUCTION

Underground

was called upon to join the individual storage sections

BY JOHN H. GIROUX

sidiary, and the tubes were made and finished at the company's plant at McKeesport, Pa.

Formed Into Bull Plugs

After seamless tubing of the required length and OD had been formed, the ends of each section were heated and hammer forged into a bull-plug shape (Fig. 2). Each bull plug was then drilled and tapped for 1½-in. pipe connections. Drilling and tapping were performed on only one end of the twelve sections which would serve as the ends of each storage ditch. The other 40-ft sections had both ends tapped in order to provide interpipe connections. The pipe lengths were stress relieved, and each section, before it left the tube company's plant, was hydrostatically tested to insure that it would withstand a pressure of 2,800 psi.

Before the sections could be placed underground, they had to be tar coated to insure against gas leakage. A special material was also wrapped around each pipe to prevent corrosion. The 6-ft. trenches were dug at the Kankakee site, and the pipe lengths were carefully lowered into place by crane. Fig. 3 pictures the crane setting one of these 5,000-lb. sections into the trench.

Next step was to bridge the gaps between sections. This was done by screwing 2-in. pipe nipples into the tapped holes in the ball plugs. In order to allow for expansion and contraction, a snakelike expansion bend had to be placed between each storage pipe. Here welding played an important part (Fig. 4), for the expansion bend was butt welded to the 2-in. nipple connection that had been previously screwed to the container. The welded expansion joint was chemically treated and a special wrapper applied to it.

Location of the pipes in the ground and the nipple connections presented troubles for the weldor. Making a joint on the underside of the nipple was the most difficult operation. The weldor had to be one step this side of a contortionist to perform the job in the cramped quarters depicted in Fig. 5. To aid in overcoming fit-up difficulties, E-6010 all-position electrodes were used.

Station Connection

Next came the task of connecting the subterranean section to the main station. This is clearly illustrated in Fig. 1. Storage units were connected to the 2-in. manifold, which, in turn, is joined to the 4-in. manifold shown running between valves A and B from the station house. Valve A is used to draw gas from the 40 pipe sections in the sketch, while valve B controls the ten sections not shown.

After installation had been completed, an air test was made to determine the soundness of the storage sections and their connections. The soil was then pushed back to fill the trenches and gas was introduced into the buried pipe at a pressure of 2,240 psi. At this pressure, each sec-

tion has a storage capacity of 25,000 cu. ft.

The station house contains many pipes, valves, regulators and compressors for the correct handling of gas to and from the underground storeroom. In order to lessen costs, a three-stage compressor is used to boost the gas in graduated pressures. The first stage takes the gas to 150 psi, the second to 450 psi and the final stage to 2,240 psi at 40 F.

When drawing on this reservoir for consumer use, the gas must be passed through a heat exchanger to cope with the freezing effect brought about by lowering the gas pressure to 6 oz. Special regulators permit the withdrawal of gas at a rate of 125,000 cu. ft. per hour.

As a result of the success of this installation at Kankakee, the Public Service Co. of Northern Illinois has made plans for a larger plant at Mount Prospect, Ill. This new project, now under construction, will have a gas capacity of 40,000,000 cu. ft. And it won't be the last of underground gas storage in this territory.

Fig. 4—Here a weldor butt welds the 2-in. pipe nipple to the expansion joint

GAS-SHIELDED PROCESSES

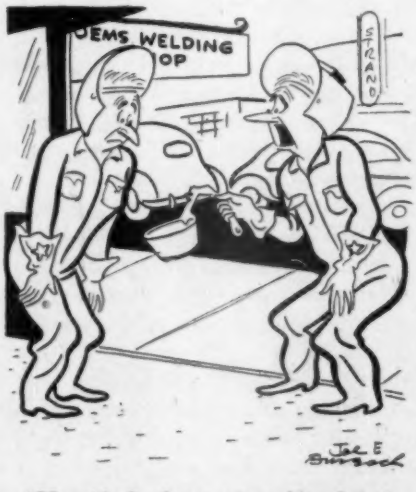
(Continued from page 55)

source of power and the electrode can be either positive or negative. The type of joint determines to some extent whether it is preferable to use straight or reversed polarity.

The procedure used in the repair of magnesium castings by inert-arc welding is well established. The welding of magnesium alloy plate and rolled shapes is very simple. There are both manual and machine applications on simple structures. Progress on highly stressed primary structures has been hindered by stress corrosion. This is not confined to inert-arc welding, but shows up in magnesium welded by all fusion welding processes. The matter is being investigated very thoroughly and will no doubt be overcome in due course of time.

In the absence of reliable field application data, it is possible to get a definite idea of the possibilities of helium or argon arc welding by observing some of the results produced in our developmental work. If a butt weld made on ⅛-in. magnesium alloy plate, for instance, is of average appearance and quality and is suitable for a production job, there is no reason why we cannot get a very good idea of what can be done on a production basis by referring to the procedure used to weld it.

This brings to mind a useful observation made during the early stages of the developmental work. It was found that if a butt weld was made between two magnesium alloy plates with squared edges, a dark thin line usually occurred along the center of the "drop down." This may have been caused by an unbroken oxide film on the lower butting edges of the plates. It was also found that a small reverse bevel, even though only a few thousandths of an inch, was sufficient to prevent the line of supposed oxide from forming.



"My wife broke it on my head and now she's making *me* fix it!"

Magnesium and aluminum are by no means the only metals to which inert-arc welding is applicable. A few others that have been successfully welded are mild steel, stainless steel, Inconel, Everdur and copper. (Fig. 7 shows the section of a weld in electrolytic copper.) The problems are little different from those encountered in the welding of aluminum or magnesium. Briefly, the general welding procedure requires that all grease, oil, dirt and harmful oxides be removed prior to welding. Of the materials mentioned, only aluminum requires a flux when welded with direct current, and only magnesium requires reversed polarity (electrode positive).

With straight polarity (electrode negative), the allowable current can be roughly estimated at 100 amp for each 1/16-in. of electrode diameter. Thus, 200 amp could be used with a ⅛-inch. tungsten electrode.

Gas consumption is usually about 12 to 15 cu ft per hour of argon or 20 to 30 cu ft per hour of helium, regardless of the material or joint preparation.

Table I summarizes the methods of arc control and heat output.

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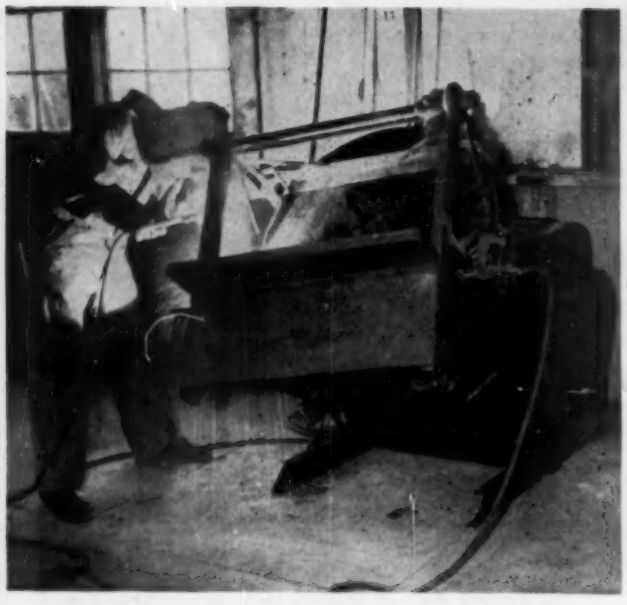

Agricultural students learning to weld farm equipment

Air conditioning students learning to make gas pipe welds

Engineering Students Learn Welding

California Polytech teaches concrete applications of welding to four specific fields—agricultural, mechanical, air conditioning and aeronautical engineering

BY RICHARD C. WILEY

Welding Instructor,
California Polytechnic College

At California Polytechnic College, San Luis Obispo, welding serves as an important related subject to four major departments: agricultural, mechanical, air conditioning and aeronautical engineering. The set-up at this state college for agriculture and industry well illustrates the versatility of the applications of welding.

They Learn to Weld

In every case the first aim of the welding department is to familiarize students with welding techniques and uses. California Polytechnic is unique even among its kind in that it advocates the teaching of basic skills and actual practices in the first two years of college work. Thus the student who receives a degree as a mechanical engineer has a physical as well as a theoretical knowledge of welding and a concrete idea rather than a vague notion of how the welding processes may be applied to his particular field. This concept is

★ TRAINING

carried through without exception into each of the four engineering majors named in the first paragraph.

The welding department does not aim to produce welding operators, though that may be a by-product, but rather to present both the theory and the practice of welding to these four diversified groups.

An extensive project system is used to apply the knowledge gained in the class and drafting room and in the shop. These projects, both on a group and individual basis, have included such items as the design and fabrication of welding cylinder trucks, large and small utility trailers, the use of jigs and fixtures in a production job of reworking steel fence posts, modification of a 150-ton hydraulic press, and a jet-engine test stand—to mention some of the operations carried out by the students.

Agricultural engineering students are taught welding primarily from the viewpoints of structural design, repair, maintenance and cost estimation. In the initial courses in oxy-acetylene and arc welding, particular emphasis is laid on small farm-type a-c and d-c welders. Then the use of welding in the repair and fabrication of farm machinery and farm buildings is stressed.

As more and more farms have electric power available under rural electrification programs, the use of the arc-welding transformer is increased. Particular concern is paid to this recent development because of the value of welding to farmers. During harvest period, for example, the speedy repair of broken equipment can mean the difference between financial failure and success.

Portability of the a-c welder, although limited, is another desirable feature gained with the installation of plug outlets in the farm shop and also in pump houses located around the ranch or farm.

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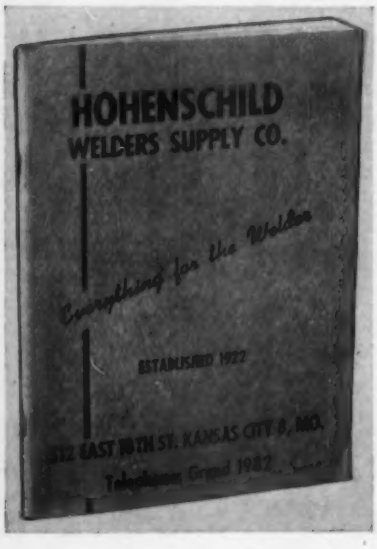

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BY W. J. Hohenschild

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On a four-year program, the engineering uses of welding are presented to the mechanical engineering group in the study of design, welding codes, cost estimation, fundamentals of welding metallurgy, weldability of ferrous and non-ferrous metals, and metallography as applied to welding. Another important phase of this course is the physical testing of welds in the laboratory.

Students in college-level air conditioning and refrigeration are primarily interested in the lighter types of welding. This includes brazing and silver brazing as used in ferrous and non-ferrous metals and alloys. Here, pipe welding and the fabrication of welded fittings make up the main part of the course. The study of pressure piping codes is likewise essential.

Aircraft Applications

Aeronautical engineering students are given work in light alloy-steel tubular construction as found in aircraft fuselage. Instruction is also given in the welding of ferrous and non-ferrous metals and alloys, including stainless steel, aluminum, Monel and Inconel. The atomic-hydrogen and inert-gas-shielded arc processes are being studied because of their application to the aircraft manufacturing industry. Welding is taught to the aeronautical engineering group to conform with CAA standards.

The welding department at California Polytechnic College has as its goal the presentation of welding as a related college engineering course geared to industry. An adequate shop and laboratory for this purpose includes the equipment for: (1) a-c and d-c metal-arc welding; (2) oxy-acetylene welding; (3) inert-gas-shielded arc welding; (4) atomic-hydrogen welding; (5) resistance welding; (6) flame-hardening; (7) machine flame-cutting; (8) weld positioning; (9) submerged-melt welding; (10) oxy-arc welding; (11) heavy-duty press for hot and cold forming and (12) physical testing and welding metallographic laboratory.

With such equipment, a college can present a well rounded program that should enable its students to enter industry or agriculture with an up-to-date knowledge of welding and its applications.

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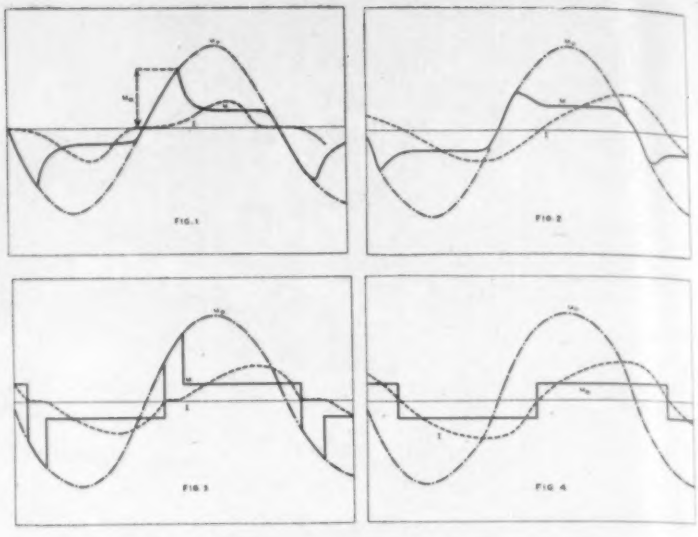

A Canadian research engineer takes issue with the conclusions of Arthur Simon on a new a-c welder. Mr. Simon conducts his own defense

Discussion

BY C. VOLFF

Electrical and Welding Research, L'Air Liquide Society, Montreal, Que., Canada

THE theory involved in the article, New Design for A-C Welders (THE WELDING ENGINEER, June, 1947), applies not only to this special transformer but to all good welding transformers now on the market.

The paragraph referred to is as follows:

"In the new-type welder, the secondary open-circuit voltage leads the secondary current, as is shown by the curves of Fig. 8, which are drawn from an oscillogram. The phase difference is such that the voltage at current zero is about equal to the arc voltage. The arc, therefore, is reestablished promptly after passage through current zero. The result is a substantially square current wave. The current wave flows during practically all of each half cycle, affording a maximum amount of energy supply to the arc."

It will be proved that the shape of current and voltage waves depends on the following factors only:

(a) The open-circuit voltage of the transformer.

(b) The power factor of the transformer itself (in short circuit).

If the open-circuit voltage is high enough and the power factor low enough, the current and voltage curves will always be of the same general shape as claimed in the above-mentioned article.

BLONDEL'S OSCILLOGRAMS

In the 19th century, Blondel, the inventor of the oscillograph which bears his name, took oscillograms of an a-c carbon arc under the following conditions:

(1) With a resistor in series with the arc (high power factor).

(2) With a coil in series with the arc (low power factor).

In the first case (Fig. 1) no current flows at each alternance during a certain length of time. In the second case (Fig. 2) the current is nil for no appreciable length of time, and hence the arc is more stable as the electrode has no time to cool.

The mathematical analysis of an a-c arc has been particularly studied by C. Macherey.*

C. Macherey supposed that the arc voltage was as shown on Fig. 1; *i.e.*, that the voltage at time of striking (U_s) was greater than the permanent arc voltage (U), which assumption is justified by ionization consideration. He found that two different types of arcs could take place in accordance with Blondel's experiments.

(a) "Broken arcs" in which no current flows during a certain length of time.

(b) "Unbroken arcs" in which current is nil for no appreciable length of time.

The limit between these two types is given by the following expression (when $U_s = 2U$):

$$\underbrace{\arcsin\frac{\sqrt{2}\,U}{U_o}}_{A} = \underbrace{\phi - \arcsin\frac{U}{U_o\sqrt{2}\cos\phi}\,\frac{e^{\frac{\pi}{2}}-1}{e^{\frac{\pi}{2}}+1}}_{B}$$

in which U_o is the no-load voltage and cos ϕ the power factor of the transformer in short circuit.

When A>B broken arcs take place (Fig. 3).

When A<B unbroken arcs occur (Fig. 4).

As can be seen by comparison of Figs. 1 and 3 and Figs. 2 and 4, theory confirms experience.

Macherey's formula can be simplified to the following formula, which applies to unbroken arcs:

$$C = \frac{U_o \sin\phi}{2.25\,U} + \frac{U}{2U_o} \geq 1$$

The greater is C—1, the more stable the arc. The ability of a welding transformer to yield stable arcs can be estimated by this formula.

We can conclude that, provided the no-load voltage is high enough and the power factor low enough, regardless of design, any welding transformer can be used to strike and maintain an arc properly.

The transformer described in the article features only a new and special way to get results already obtained by any good unit on the market.

*Revue Générale de l'Electricité, December, 1944.

☆ ☆

Rebuttal

BY ARTHUR SIMON

Engineering Consultant, Milwaukee

MR. VOLFF sets up a straw man and then proceeds to destroy him. The writer and his associates do not claim the discovery of any new phenomenon. Also, they are familiar with the work of the early investigators of the electric arc, including Blondel, as well as with the contemporary investigations.

Without unnecessarily repeating that which has been said about the welding arcs by others, the writer only wanted to point out that, in the present welder, there is practically no "dwell" at voltage zero. This is the result of a careful and novel matching of many details of the new design. The two criteria which Mr. Volff lists as the only ones which determine the current and voltage waves of the arc depend in turn on many factors in the design of the transformer. It is the combination of these factors which determines the ultimate result.

While the characteristic referred to is of prime importance and is aimed at by all designers who know welding requirements, it has, to our knowledge, not been attained to a like degree by any other make.

Competitive tests in laboratories and in the field fully support the claims of superior performance.

Arc-Welding Cable Data

Table I—Arc-Welding Electrode and Ground Cables

National Rating of Welder in Amperes	Recommended Cond Size AWG*	Number of Strands	Stranding	Diameter of Conductor Inches	Over-all Diameter Inches	Resistance Ohms/1000 ft. †	Impedance Ohms/1000 ft. ‡
100	4	1,050	7/3/50/.0063	.30	.510	.318	.321
150	2	1,680	7/3/80/.0063	.38	.575	.196	.200
200	2	1,680	7/3/80/.0063	.38	.575	.196	.200
300	0	2,695	7/7/55/.0063	.46	.700	.124	.129
400	00	3,381	7/7/69/.0063	.48	.775	.095	.104
500	00	3,381	7/7/69/.0063	.48	.775	.095	.104
600	000	4,284	7/7/87/.0063	.57	.845	.078	.086

Table II—Portable Cable between Arc Welder and Power Source

A-c Arc Welders (Transformer Type with Single-Phase Primary) — Use Three-Conductor Cable With the Third Conductor as a Ground Wire							Motor Driven D-c Welders — With A-c Motor Drive — For 3-Phase Motors Use 4-Conductor Cable With the Fourth Conductor as a Ground Wire					Motor Driven D-c Welders — With D-c Motor Drive — Use 3-Conductor Cable with the Third Conductor as a Ground Wire				
Nom Rating of Welder in Amp	Rated Primary Load Amp	Primary Volts	Recom Cond Size*	Number of Strands	Diam of Bare Cond	Over-all Diam	Motor Rating Volts	Recom Cond Size*	Number of Strands	Diam of Bare Cond	Over-all Diam	Motor Rating Volts	Recom Cond Size*	Number of Strands	Diam of Bare Cond	Over-all Diam
100	62	110	4	49	.260	1.17	...	...	...	...	...	...	...	...	...	...
	31	220	8	49	.160	.93	...	...	...	...	...	...	...	...	...	...
	16	440	12	49	.100	.61	...	...	...	...	...	...	...	...	...	...
150	...	...	...	...	...	...	220	10	49	.130	.72	115	2	133	.340	1.34
	...	...	...	...	...	...	440	14	41	.080	.60	230	6	49	.230	1.02
200	72	220	2	133	.340	1.34	220	8	49	.160	.97	115	0	133	.430	1.73
	36	440	8	49	.160	.93	440	12	49	.100	.66	230	4	49	.260	1.17
	...	...	...	...	...	...	550	14	41	.080	.60	550	10	49	.130	.66
§200	50	220	6	49	.205	1.02	...	...	...	...	...	...	...	...	...	...
	25	440	10	49	.130	.66	...	...	...	...	...	...	...	...	...	...
	20	550	12	49	.100	.61	...	...	...	...	...	...	...	...	...	...
300	77	220	2	133	.340	1.34	220	6	49	.205	1.07	115	000	259	.530	1.98
	39	440	8	49	.160	.93	440	10	49	.130	.72	230	2	133	.340	1.34
	31	550	8	49	.160	.93	550	10	49	.130	.72	550	8	49	.160	.93
400	...	...	...	...	...	...	220	4	49	.260	1.23	...	...	...	...	...
	...	...	...	...	...	...	440	8	49	.160	.97	230	1	133	.380	1.59
	...	...	...	...	...	...	550	10	49	.130	.72	550	6	49	.230	1.02
500	125	220	0	133	.430	1.73	...	...	...	...	...	...	...	...	...	...
	63	440	4	49	.260	1.17	...	...	...	...	...	...	...	...	...	...
	50	550	6	49	.205	1.02	...	...	...	...	...	...	...	...	...	...
600	...	...	...	...	...	...	220	2	133	.340	1.46	...	...	...	...	...
	...	...	...	...	...	...	440	6	49	.205	1.07	230	000	259	.530	1.98
	...	...	...	...	...	...	550	8	49	.160	.97	550	4	49	.260	1.19

*Recommendation of National Electric Code.
†At 60 C Copper Temperature.
‡Based on the assumption that the two leads (electrode and work cable) are taped together.
§(With carac).

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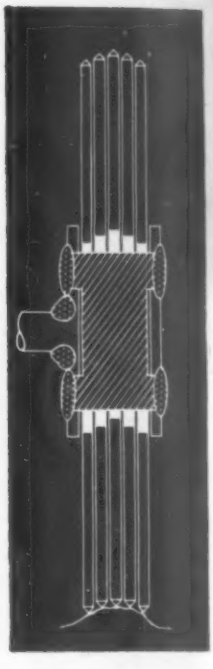

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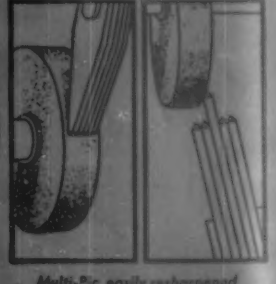

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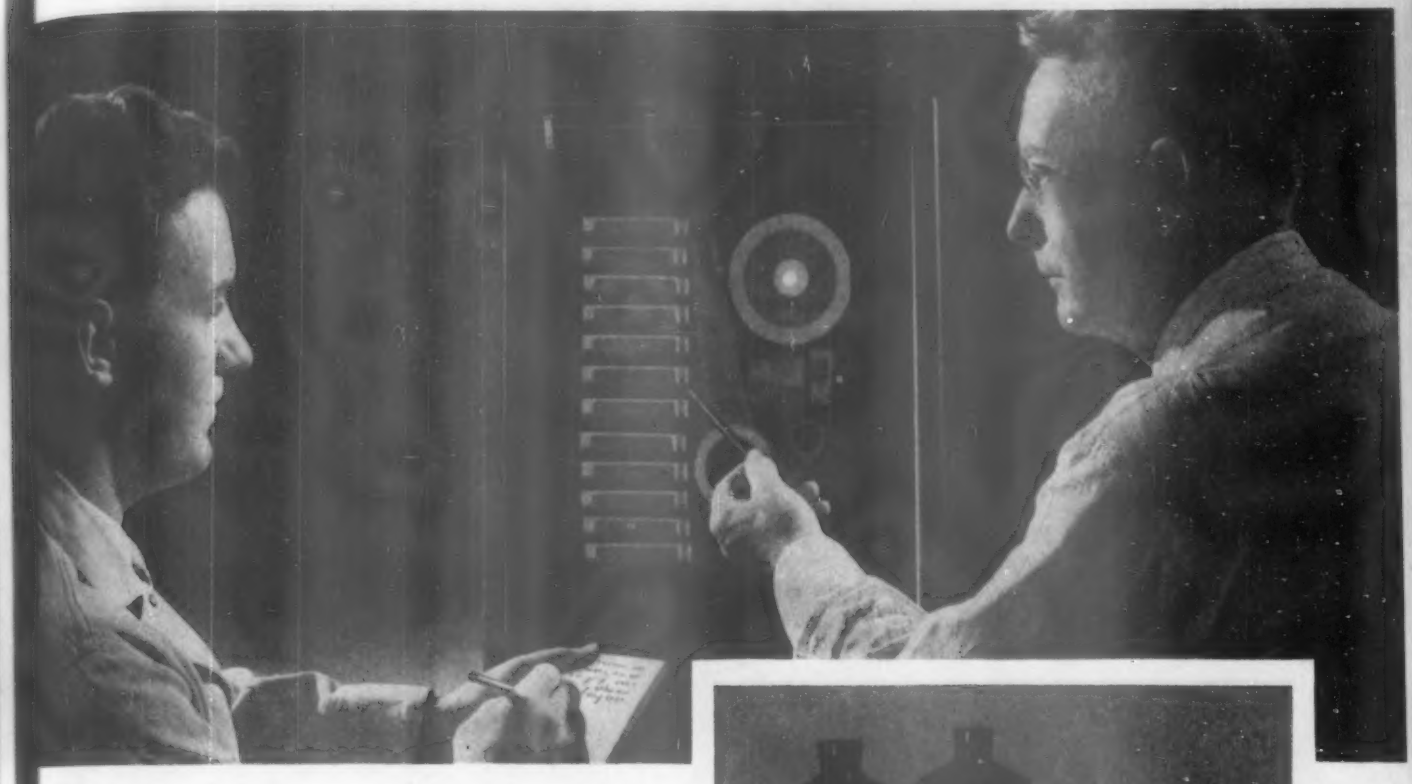

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J. G. Magrath, new executive-secretary of the American Welding Society

J. G. Magrath Will Direct AWS Activities

JOSEPH GORDON MAGRATH, formerly sales manager of McAlear Mfg. Division of Climax Industries, Inc., has been unanimously selected for the new position of executive secretary of the American Welding Society. As the chief staff officer, he will work with other members of the National Headquarters staff in directing the activities of the national engineering organization of about 7,500 members. M. M. Kelly, secretary; W. Sparagen, editor of *The Welding Journal* and director of Welding Research Council, and S. A. Greenberg, technical secretary, will continue in their present duties.

Mr. Magrath has been associated directly with welded product design as far back as 1917, first with the Budd Wheel Mfg. Co., on fabrication of wheel structures for the first World War then, in 1922-23, on welded steel sash, doors and plate fabrication for the David Lupton Sons Co. During World War II he served with Air Reduction Sales Co. in the development of welding, cutting, brazing and other flame-treatment processing of welded fabrication in shipyards, war plants and steel mills.

Mr. Magrath has been active in the work of the New York Section of the American Welding Society and has served for several years as chairman of publicity and programs. He is also a member of the American Society for Metals, Society of American Military Engineers and the Steam Specialties Club, New York.

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STACEY BROTHERS GAS CONSTRUCTION CO., Cincinnati, is building what is said to be the world's largest all-welded gas holder for the Elizabethtown Consolidated Gas Co., Elizabeth, N. J. When completed, this mammoth tank will be 276.6 ft in diameter by 227 ft high. It will hold 10,000,000 cu ft of gas.

World's Only AC Arc Welder Without A Single Moving Part!

The NEW P&H with "Dial-lectric" Control

Now . . . a *new* kind of AC welder. A vastly better welder because there's not a single moving part in the entire machine. No moving coils or cores—worm gears or sprockets—chain or lever adjustments. Nothing to get out of order or wear—nothing to bind or "freeze" from rust.

This remarkably different welder brings new operating and welding ease. Exclusive P&H "Dial-lectric" design provides simplified, finger-tip current selection. Only a three-quarter turn is required for continuous heat control—from minimum to maximum capacity. No cranks to turn—no plug-ins to make.

Other features combine to make this new P&H Welder the most outstanding contribution to even better, lower cost AC welding. Deliveries are now being made. Write for bulletin W-72—or better yet, see your P&H Representative.

LOOK AT THESE FEATURES!

- Not a single moving part
- Easier, more accurate, creep-proof "Dial-lectric" control
- No plug-ins — no cranks
- Instantaneous arc without auxiliary current boosters
- High-low welding range for general purpose or light gauge welding
- Extremely long service life
- Sturdily-built, smartly designed
- Wheel mounted for easy moving
- Removable dial for remote control
- N.E.M.A. rated

P&H ARC WELDERS
4513 W. National Ave.,
Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION
ARC WELDERS • EXCAVATORS • ELECTRIC CRANES P&H MOTORS • HOISTS • WELDING ELECTRODES

News of the Industry

Welding Distributors Hold Meeting at Omaha

A REGIONAL meeting of the National Welding Supply Association was held at the Castle Hotel, Omaha, on Oct. 2 for the west central zone, which comprises the states of Iowa, Minnesota, North and South Dakota, Missouri, Kansas, Colorado, Wyoming, Montana and Nebraska. The meeting, a one-day affair, was presided over by R. S. Mars, of R. S. and W. P. Mars Co., Duluth, who is senior vice-president of the National Welding Supply Association.

Following a brief opening address by Chairman Mars, in which the purpose of these regional meetings was outlined, L. O. Schneiderwind, Omaha Welding Co., who is the immediate past-president of the association, addressed the group on the subject, "Why We Need a Strong National Association." He contended that through coöperative effort such as association work the distributor would be able to do an even better job of serving the manufacturer of welding equipment in the welding industry.

Robert C. Fernley, secretary and treasurer of the association, spoke briefly on the objectives of NWSA, pointing out that the welding supply association was established for the purpose of fulfilling eight different objectives. The manner in which these are attained, he said, reflect the effectiveness of the association. It was his hope that the members and those eligible for membership, whether they became members of the association or not, would follow these objectives to make for better relations between the distributor, the manufacturer and the consumer.

In a roundtable discussion of business conditions throughout the west central zone, it was concluded that the welding supply business is looking up. Business conditions in general seem to have improved for the first half of this year over a like period of 1946, and the welding industry also gained because of this general improvement.

After lunch, the meeting reconvened in the afternoon and was addressed by T. B. Jefferson, Editor, THE WELDING ENGINEER, on "What the Future Holds for Welding." Mr. Jefferson reminded his listeners of the gains that have been made by welding since 1935; though speeded up somewhat by the war effort, the growth of this has been constant and healthy. The outlook for the coming years, according to surveys made by THE WELDING ENGINEER, indicates an even more extensive use of welding in the future than in the past. However, Mr. Jefferson emphasized, there is a selling job to be done to promote further gains, particularly in those fields where the use of welding is somewhat restricted by legislation or other misunderstandings. It is as much the distributors' job as any body else's to help straighten out these difficulties, for he stands to benefit from every increase in the applications of welding.

The remainder of the afternoon was devoted to general discussions of questions as: "What steps can be taken to establish better relationships between manufacturers and their distributors?" "Will manufacturers use an excessive number of distributors in the west central zone?" "Is the competition of manufacturers a serious factor?" and "Are current margins adequate in view of current costs?"

Delegates attending the west central zone meeting were: George Thrapp, The Balbach Co., Omaha, Neb.; Ernest Horejsi, Brown Welding Supply Co., Salina, Kan.; Frank Lightner and I. Boyd Rundell, Felton Welding Supplies, Salina, Kan.; F. L. Pflasterer, Fuchs Machinery & Supply Co., Omaha, Neb.; V. A. Engle, Gibbs Welding Supply Co., Des Moines, Ia.; Allen H. Young and Lewis Hunt, Independent Distributing Co., St. Joseph, Mo.; Harry Louis, Minneapolis, Minn., David Breslow, Lincoln Welding & Supply Co., Lincoln, Neb., Robert S. Mars, W. P. & R. S. Mars Co., Duluth, Minn.; John H. Keane, Modern Engineering Co., Inc., St. Louis, Mo.; Robert C. Fernley, National Welding Supply Assn., Philadelphia; L. O. Schneiderwind, Omaha Welding Co., Omaha, Neb.; F. D. Richards, D. D. Richards Supply Co., Garnett, Kan.; E. S. Wheeler, Schawinigan Products Corp., Keokuk, Ia.; H. W. Beeman and R. L. Townsend, Tweco Products Co., Wichita, Kan.; Robert D. Lofgren, U. S. Welding Works, Inc., Denver, Col.; T. B. Jefferson, THE WELDING ENGINEER, Chicago; Ray C. Bender, Page Steel & Wire Division of The American Chain & Cable Co., Chicago; and P. J. Patton, Ransome Machinery Co., Dunellen, N. J.

Exhibiting at the Winnebago County Fair, Sommerfeld Welders Supply Co., Oshkosh, Wis., found 200 or so new farm customers for arc welders, electrodes and small oxy-acetylene welding outfits to use in the repair of farm equipment

New home of Gibson Welding Supplies, 218 East Trent, Spokane, Wash.

☆ ☆

WAA Offers Surplus Heat-treating Furnaces

ABOUT $43,000,000 worth of surplus heat-treating furnaces and ovens are being offered for sale by the War Assets Administration at fixed prices ranging from 36 to 75% of acquisition cost. Built for war purposes at costs ranging from $500 to $250,000 each, the equipment includes foundation and portable furnaces for heat-treating metals and other purposes.

Prospective purchasers will have an opportunity to state their specifications for

such equipment, and inventories will be screened for types of furnaces or ovens which will fit the needs of the customer. Principal inventories are held by the following WAA regional offices: Boston, Chicago, Cincinnati, Cleveland, Detroit, New York, Philadelphia, Richmond, St. Louis, Kansas City, Grand Prairie and Birmingham.

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To Spend $75,000 on Pressure Vessel Research

SAFETY and economy are the aims of a $75,000 pressure vessel research program sponsored by the Welding Research Council of the Engineering Foundation. Walter Samans of the Sun Oil Co. continues as chairman of the project's general committee, which is made up of 87 representatives of manufacturers and users of pressure vessels, insurance companies, educational institutions and branches of the government. The studies cover four phases of the problem: design, fabrication, testing and inspection.

A sum of about $30,000 has been allocated for design research, now under way at Purdue University, under the direction of Professor R. G. Sturm.

Second largest phase of the research program is the fabrication division headed by H. C. Boardman of the Chicago Bridge & Iron Co. Approximately $20,000 has been set aside this year for such studies, some of which are under way at Lehigh University. The purpose of this program is to secure information to help code-making bodies formulate rules and assign values of safe design stresses without penalizing the fabricator and eventual purchaser.

The materials division is headed by D. B. Rossheim of the M. W. Kellogg Co., while D. L. Royer of the Ocean Accident and Guarantee Corp., Ltd., heads the inspecting and testing division. At present the work of these committees is confined to a critical review of existing literature.

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Gibson Welding Moves into New Building

GIBSON WELDING SUPPLIES, Spokane, Wash., has moved into its new home at East 218 Trent. The building is constructed of concrete blocks and has concrete floors with built-in radiant heat coils. The company is owned and managed by V. B. Finch.

☆ ☆

Furnace Makers Conduct Prize Contest

INDUSTRIAL FURNACE MANUFACTURERS ASSOCIATION is offering $1,500 in cash prizes for the best published articles describing the economic advantages obtained by the use of modern industrial furnaces, kilns and ovens. Papers published between October 1, 1947, and September 1, 1948, will be eligible for the three rewards of $1,000, $300 and $200. In addition, non-cash awards will be made to the magazines publishing the three winning awards. Formal rules and other information can be obtained from the IFMA, 420 Lexington Ave., New York City 17.

Titan

BRONZE WELDING RODS

are available in the quantities you need . . . when you need them

Here is good news for welders who look for only the best in welding equipment and supplies. TITAN Bronze Welding Rods, recognized the world over for their high quality and uniformity, are now available in whatever quantity you require . . . and can be shipped promptly.

TITAN Bronze Welding Rods are carefully deoxidized to remove injurious gases and assure ductile, strong welds free of porosity. Seven standard alloys meet every requirement.

Write for complete information.

TITAN Metal MANUFACTURING CO.
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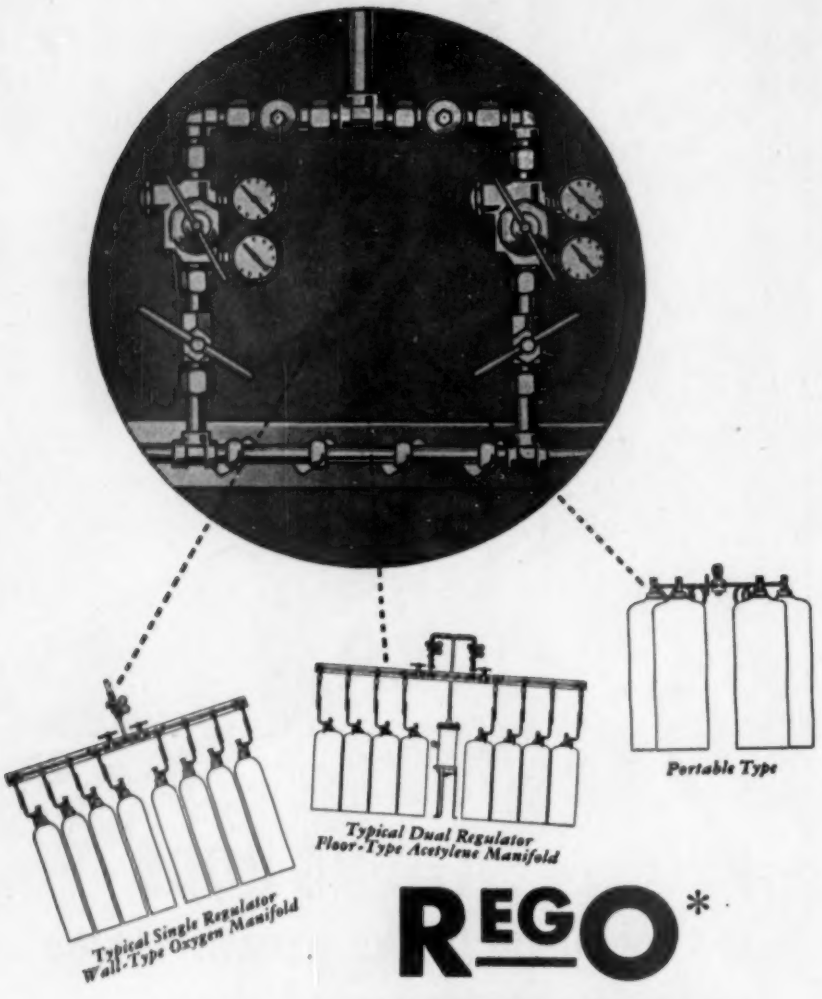
Portable Type
Typical Dual Regulator Floor-Type Acetylene Manifold
Typical Single Regulator Wall-Type Oxygen Manifold

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CONSTRUCTION

Produces Better Manifolds

● RegO design means safe performance, long life and low maintenance costs. Here are some of the construction features you get when you specify RegO Manifolds...

Unit Construction... The header section of each RegO Manifold is virtually one-piece; extra-heavy seamless brass pipe is run through the forged brass header fittings, the cylinder station shut-off valves and the master shut-off valves . . . all permanent connections are then silver-brazed. The header assembly is bolted to a heavy steel I-beam to assure permanent alignment.

Precision Regulation... large capacity two-stage RegOlators assure constant and uniform delivery pressure to the pipe system.

Extra Convenience... standard RegO Manifold construction provides individual shut-off valves at each cylinder station . . . this design permits any one cylinder to be disconnected without shutting down the entire manifold. Master shut-off valves control each main branch.

Rigid Tests... header pipe, valve bodies and fittings withstand pressure up to 10,000 psi and each complete RegO Manifold is subjected to a sustained air pressure test of up to 2,000 psi.

There Is A RegO Manifold to Fit Your Most Exacting Requirements

REGO MANIFOLDS *for* Oxygen • Acetylene • Hydrogen • Nitrogen
and other high pressure gases

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The BASTIAN-BLESSING Company

4201 W. Peterson Avenue Chicago 30, Illinois

Pioneer and Leader in the Design and Manufacture of Precision Equipment For Using and Controlling High Pressure Gases

Technical Groups Invited to Study German Research

TECHNICAL societies, trade associations and other private industrial groups have been invited to coöperate with the Office of Technical Services, Department of Commerce, in evaluating some 500,000 technical documents revealing the details of Germany's wartime industrial technology. The documents, all on microfilm reels and in German, have been collected over the past two years by American technical investigators in Germany. Material was selected from the files of major German industrial plants, research laboratories, universities and government offices.

OTS plans to compile and publish a compendium of this knowledge and divide it into appropriate sections—automotive, utilities, machinery, etc. Experts who volunteer their services to the project will benefit by being the first to scrutinize the original material. They will also be free to publish articles based on the documents under their own names, providing that the same articles are made available for publication in the compendium.

Those interested in assisting in the compendium project are urged to write: John C. Green, director, Office of Technical Services, Washington 25, D. C. The letter should state the volunteer's field of interest and summarize his technical background.

☆ ☆

Handy & Harman Merges with Thos. J. Dee Co.

HANDY & HARMAN Co., New York, refiner and producer of silver and gold alloys, has joined forces with Thomas J. Dee & Co., Chicago, maker of products for the dental and jewelry professions. The latter will become the Dee division of Handy & Harman and will continue to function under its present executive staff, which includes Harry E. Radix, president, and Thomas G. McMahon, secretary-treasurer. Dee will maintain its present downtown Chicago office at 55 E. Washington, while Handy & Harman's Chicago office will be moved from 20 N. Wacker Drive to the Dee plant at 1900 W. Kinzie St.

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Saginaw Farmers Learn Welding at County Fair

FARMERS in and around Saginaw, Mich., were given an opportunity at the recent Saginaw County Fair to have their broken farm tools hard-faced or braze-faced. This was through the courtesy of the Saginaw Welding Supply Co., which invited agriculturists to bring in any broken cast-iron parts or tools they would like to see being brazed. Practical working demonstrations by company technicians showed clearly how a gas welding outfit or small farm arc welder makes possible immediate on-the-spot repairs. A demonstration was also given of the application of hard-facing alloys to prolong the life of parts and tools subjected to abrasive wear.

This G-E sequence weld timer automatically provides accurate timing of the welding cycle at Bailey Meter Company, Cleveland.

WELDS *4 times faster* with G-E ELECTRONIC WELDING CONTROLS

Bailey Meter Company has increased its production rate of certain meter and automatic control parts 400 per cent with a new projection welding machine equipped with a G-E sequence weld timer and ignitron contactor.

With spot welding it took 18½ hours per 100 pieces; now, it takes 4½. G-E welding controls are responsible for a good share of this increase because they provide automatic and accurate timing of the welding cycle.

This timing eliminates the delay and operator error of the manual control on the foot-operated machine formerly used. And, it assures more consistent welding.

NOW, G-E CONTROLS ARE AVAILABLE IN ONE CABINET

General Electric now offers two new, improved lines of welding control—synchronous and non-synchronous. Each has all its components co-ordinated in one, attractive cabinet. Check these outstanding features:

1. **Control is factory-assembled, ready-to-install.**
2. **Easy servicing through large side door of cabinet.**
3. **Control station always faces operator.**

Investigate these and other features in Bulletins GEA-4699 and GEA-4726.

HAVE YOU SEEN "This Is Resistance Welding," G.E.'s full-color movie? It explains what resistance welding is, and where and how it has improved production.

Your nearest G-E office, local utility, or resistance welding machinery manufacturer representative will be glad to arrange a free showing for you.

GENERAL ELECTRIC

General Electric Company, Sect G645-42
Schenectady 5, New York

Please send me the following resistance welding control bulletins:

- ☐ GEA-4699 Synchronous Precision Control for Spot and Projection Welding
- ☐ GEA-4726 Nonsynchronous Control for Spot and Projection Welding
- ☐ GEA-4571 The Importance of Control
- ☐ GEA-3318B Sequence and Sequence Weld Timers
- ☐ GEA-3058D Ignitron Contactors

Name _____

Company _____

Address _____

CARBON ARC WELDING SAVES COSTLY CASTINGS

speer carbon electrodes give stronger welds at low cost

Carbon arc welding is saving many new and used castings from reaching the scrap pile. And the use of Speer Hold-Ark Electrodes in repairing, rebuilding and modifying castings gives strong, dense welds at low cost.

An even, steady burning arc high in heat value is provided with Speer Electrodes. They have greater current carrying capacity and deposit weld filler faster. Good fusions—hard and uniform—are achieved through extra concentrated heat.

Speer Electrodes develop a better point . . . with a short burning angle that increases electrode life 33%. Extra strength—22% harder—cuts breakage losses and helps withstand the abuse of automatic welding machines.

Experience for yourself the economies and other benefits of Speer Carbon Electrodes for all types of carbon arc welding or cutting. Write for a trial lot now.

Photo courtesy of the Hobart Bros. Co.

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brushes · contacts · welding electrodes · graphite anodes · rheostat discs · packing rings · carbon parts

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Central Zone Jobbers Thresh Out Their Problems

A STIMULATING, informative and helpful meeting was called to order by J. N. Alcock, Saginaw Welding Supply Co., Saginaw, Mich., as president of the central zone of the National Welding Supply Association, on the morning of Sept. 22 at the Rowe Hotel, Grand Rapids, Mich. The thirty or so members, associate members and guests who participated indulged in a frank, off-the-record discussion of mutual problems ranging from patent suits to labor laws and from credit problems to the topic of what percentage of gross business should be allocated for advertising.

After Ralph E. Chase, Chase Welding Supply Co., Benton, Ill., the national president of the association, had given an address of welcome, Robert C. Fernley, national secretary-treasurer, made public the results of a business-condition survey compiled at NWSA headquarters. In general, the first two quarters of this year showed a healthy percentage of gain over the corresponding 1946 period:

First Quarter	*Zone*	*Second Quarter*
32%	Eastern	23%
19%	Southeastern	40%
16%	Central	2%
18%	West Central	21%
11%	Southwestern	7%
55%	Western	16%
23%	Average	15%

Glenn Garman, Purity Cylinder Gases, Inc., Grand Rapids, felt that these figures should be broken down into the three basic divisions of equipment, supplies and gases, and that the latter should be expressed as percentages of gain or loss over the number of cubic feet sold during the corresponding quarter of the previous year. It was decided to adopt both of these suggestions.

The members also voted to authorize Secretary Fernley to conduct another survey to determine what methods of advertising distributor members are favoring and what percentage of their sales is being spent for advertising.

Bad debts and slow paying customers are becoming more of a problem these days, the discussion revealed. Some of the other topics discussed were a suit brought against one of the members for infringement of a patent covering a slip-on soldering tip, distributor margins, sales tax obligations and what is expected of a welding distributor under provisions of the present national wage-and-hour law.

An informal after-luncheon address was made by Irving B. Hexter, president of The Industrial Publishing Co., Cleveland. Mr. Hexter warned his distributor audience not to be too complacent over past achievements but to get ready for business squalls ahead.

In lieu of a second day's business meeting, those distributors who remained in Grand Rapids overnight went in a body to visit the plant of the Aladdin Rod & Flux Mfg. Co. R. H. Ogden, president of the latter concern, acted as host and presented an interesting demonstration of the possibilities of welding aluminum and filling holes by means of white-metal welding rods.

Delegates in attendance at the central zone meeting were: A. H. Homrighaus, Jr., Welder Service Co., Toledo, O.; J. W. Richards, Welders Sales & Service Co., Youngstown, O.; J. M. Robinson, Robinson Welding Supply Co., Detroit; Ralph E. Chase, Chase Welding Supply Co., Benton, Ill.; James N. Alcock, Saginaw Welding Supply Co., Saginaw, Mich.; Harold M. Macauley, Wolverine Gas Products, Inc., Saginaw, Mich.; R. J. Koltes, The Red Arrow Sales Corp., Madison, Wis.; Ray W. Metzger, Compressed Gases, Inc., Cleveland; W. J. Bentley, Bentley Sales Co., Milwaukee; Glenn G. Garman, H. W. Sweet and Edward Butterfield, Purity Cylinder Gases, Inc., Grand Rapids, Mich.; George Sommerfeld, Sommerfeld Welders Supply Co., Oshkosh, Wis.; Howard M. Smith, Jackson Welding Supply Co., Jackson, Mich.; Irving Hexter, *Industry and Welding*, Cleveland; Clyde B. Clason, THE WELDING ENGINEER, Chicago; Robert C. Fernley, National Welding Supply Assn., Philadelphia; James E. Norcross, Arcos Corp., Philadelphia; Wm. B. Rea, Sight Feed Generator Co., Richmond, Ind.; W. H. Siefferman, Miller Electric Mfg. Co., Appleton, Wis.; C. M. Cooper, Welding Equipment & Supply Co., Grand Rapids, Mich.; Frank E. Kessler, Welding Equipment & Supply Co., Detroit; Wm. T. Johnson, Johnson Welding Equipment Co., Chicago; R. Dudley Layman, Layman Welding Supply Co., Grand Rapids, Mich.; Edward MacDonald, Central Welding Supply Co., Lansing, Mich.; H. D. Hoffmyer, Welding Gas & Supply Co., Grand Rapids; Jack Honhart, Atlas Welding Accessories, Detroit; Ray C. Bender, Page Steel & Wire Div., American Chain & Cable Co., Inc., Chicago, Ill.; G. R. Posthwait and Harris A. Goodwin, The Bastian-Blessing Co., Chicago; George A. Maurath, Sr., Maurath, Inc., Cleveland; Roland H. Ogden, Aladdin Rod & Mfg. Co., Grand Rapids, Mich.; Harry Stearns and Fred Feld, Perfect Glove Co., Milwaukee; Pat N. Murphy, Perfect Glove Co., Grand Rapids, Mich.; Thomas M. Wall, Wall Chemical Division, Liquid Carbonic Corp., Detroit; and Matthew R. Cutter, Moulds Brass Foundry Co., Benton Harbor, Mich.

☆ ☆

Install Radiant-Heating Field "Lab" at Georgia Tech

STUDENTS of engineering at the Georgia School of Technology will be given the opportunity to make a practical field study of radiant heating as compared with conventional methods. A multi-story housing project at Georgia Tech, under construction by the J. A. Jones Construction Co., is being built in the form of the letter "H." One wing will be heated by means of wrought iron pipe coils, while the other wing will have conventional convector heating. It will thus be possible to make an accurate comparison of the efficiencies of the two methods.

The radiant-heating pipe coils are being shop-fabricated by Williams Bros. Corp., Chamblee, Ga. Sinuous-type coils are being used, each room having a separate coil equipped with a balancing valve.

WeldOlet* Fittings reduce pressure-drop on branch pipe outlets

Engineers concerned with piping are constantly faced with the problem of excessive pressure drop on right angle branch pipe lines. This is due to the fact that conventional branch pipe fittings and welded pipe-to-pipe joints do not provide enough "entrance area" into the branch line and the turbulence created by the sudden change in flow-direction further restricts the effective outlet area.

WeldOlet* Fittings reduce this problem to the vanishing point. The large, funnel-shaped inlet provides ample "entrance area" for full branch line capacity and reduces turbulence to the point where it does not interfere with the flow into the branch line.

In addition, WeldOlet* Fittings provide adequate reinforcement at the joint to restore full original pipe strength and provide ample safety. WeldOlet* Fittings are easy to install, too, for either butt-welded, threaded or socket-welded branch pipe connection.

Write today for your copy of the new Bonney WeldOlet* Fittings catalog. It contains complete specification, application and installation data.

For Stronger, Safer, More Economical Branch Pipe Outlets
USE WELDOLET* FITTINGS

Forged Fittings Division
BONNEY FORGE & TOOL WORKS • 354 Green Street, Allentown, Pa.
Also Manufacturers of a complete line of wrenches and service tools for every use.

HERE'S HOW TO GET
SERVICE + SAVINGS
ON ALL YOUR
WELDING AND CUTTING EQUIPMENT

Burdox Extra-Flex Welding Cable

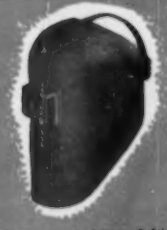
Welding and Cutting Torches

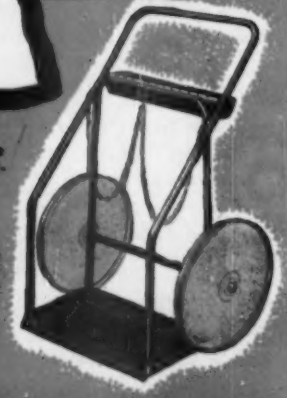
When you need SERVICE use this ONE convenient
SOURCE OF SUPPLY

BURDOX WELDING • CUTTING SAFETY EQUIPMENT

To get the most out of any welding or cutting job, standardize on BURDOX products. They are produced by welding men who know how to give you the best results... in the quickest time... at the lowest cost! Every BURDOX product provides the latest improvements, and offers outstanding quality at prices that represent savings to you in the purchase and in the long run. BURDOX products are handled by leading welding supply distributors. Check your needs by sending coupon below today for free new catalog.

Lift Front Goggles


Helmets and Handshields


Burdox DeLuxe Portable Cylinder Truck. Available with or without solid rubber tires.

Welding and Cutting Outfits

THE BURDETT OXYGEN CO.
Established 1920
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Welding and Cutting Equipment and Supplies
Industrial Safety Equipment

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3302 Lakeside Ave., Cleveland 14, O.
Please send free new 64 page catalog.
FIRM.....
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Battery Welders Do Job When Load is Limited

WITH a couple of drawing and stamping presses, some spraying equipment and two press-type projection welders, Precision Mfg. Co., Bergholz, O., has just about succeeded in cornering the production of phonograph turntables. Some 75 employees work in two shifts in order to fill the requests of 15 major phonograph manufacturers for this product, and they turn out nearly 14,000 assembled turntables per day.

The plant is located five miles from the nearest power substation, and all of the load that Precision is allowed is 15 kva. Heavier loads would cause serious flicker and voltage drops in the neighboring community. The company got around the load limitations by using welders powered by storage batteries. To operate a three-phase battery charger that keeps these welders working 16 hours a day, a minimum of 30 amp suffices on a 220 volt line.

The major differences between turntables is in the mounting bracket, which is welded to the turntables in a single operation. The drawn and punched table is placed over the bracket in the lower die, the head of the machine is brought down and battery current is turned on automatically through a carbon-pile contactor to form the six welds at the projection simultaneously. A sequence timer causes the machine to press the parts together for one second, hold the welding current on for ⅓ second and hold the parts under pressure during the cooling for ½ second. At the end of the cycle (a matter of under 2 seconds) the head of the machine lifts for removal of the completed assembly. Periodic inspection of weld quality is made twice a day by attempting to pry test brackets loose from the turntable with a chisel.

☆ ☆

Railroads Continue to Install Welded Rails

SLOWLY but surely railroad companies are being convinced that welded rails are the answer to reduced maintenance costs, repair problems and, most of all, an end to the clickety-clack that makes many an overnight passenger wish "he had made this trip by air." Such roads as the Chicago & North Western and the Elgin, Joliet & Eastern have recently expanded the use of "continuous rails." C. & N. W. has one such rail 2,652 ft long; the major part of the road's program, however, consists of welding two 39-ft standard lengths into one 78-ft rail. Tests have proven the weld to be as strong as the rail. Elgin, Joliet & Eastern boasts the longest continuous rail in the U.S.—some 12,782 ft.

Last year the Santa Fe put an end to the amplified clickety-clack in the Franklin Tunnel on the Coast range by installing 5,600 ft of welded rail.

Illinois Central reduced repair costs of rails across its Cairo bridge by substituting 4,400 ft of continuous rails laid in 1,058-ft lengths. Pounding, resulting in chipping of the former bolted rails, was thus eliminated. Major welding methods of joining these rails are: submerged melt, flash and oxy-acetylene pressure welding.

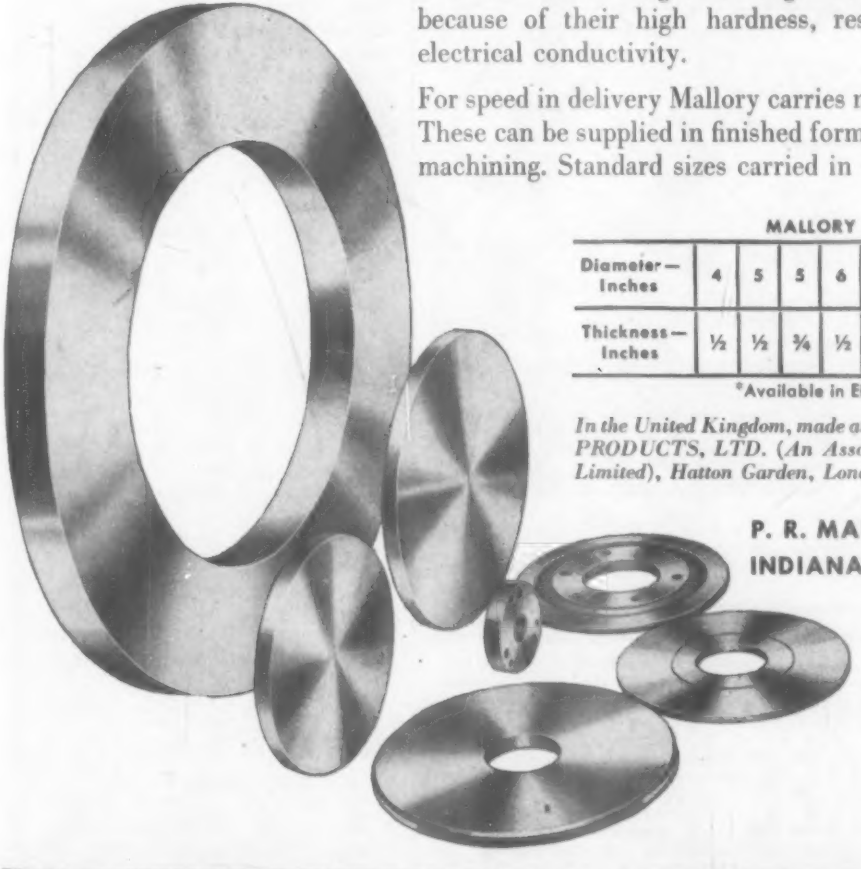
A product of
RESISTANCE
WELDING ELECTRODE
HEADQUARTERS...

SEAM WELDING WHEELS *as you want them*

MALLORY Seam Welding Wheels give you the quality you want, the size you want, the particular kind of performance you want. They are forged from Mallory developed alloys to meet your needs *exactly*. Just tell us the diameter, thickness and characteristics of the material being welded, and Mallory engineers will do the rest.

Seam welder wheels made of Mallory "100" metal (R.W.M.A. Class 3) are especially recommended for welding stainless steels. Those of Elkaloy† "A" (R.W.M.A. Class 1) are used advantageously on coated metals such as galvanized iron and terne plate. Mallory "3" (R.W.M.A. Class 2) is most widely used on plain low carbon steel. In applications such as butt-seam welding of tubing Mallory "53B" metal wheels are used because of their high hardness, resistance to wear and their good electrical conductivity.

For speed in delivery Mallory carries many sizes of wheel blanks in stock. These can be supplied in finished form or sent rough forged for your own machining. Standard sizes carried in stock are:



MALLORY "3" (R.W.M.A. Class 2)

Diameter—Inches	4	5	5	6	6	7	*8	*8	8	*10	*10	*10	12	12
Thickness—Inches	½	½	¾	½	¾	⅜	⅜	½	¾	⅜	½	¾	½	1

*Available in Elkaloy "A" (R.W.M.A. Class 1).

In the United Kingdom, made and sold by MALLORY METALLURGICAL PRODUCTS, LTD. (An Associate Company of Johnson, Matthey & Co., Limited), Hatton Garden, London, E.C. 1.

P. R. MALLORY & CO., INC.
INDIANAPOLIS 6, INDIANA

†Reg. U. S. Pat. Off

P. R. MALLORY & CO. Inc.
MALLORY
RESISTANCE WELDING MATERIALS

ELECTRODES — HOLDERS — SPECIAL DIES AND FIXTURES — ELKONITE*— ALLOY ROD AND BAR STOCK — FORGINGS — CASTINGS — ACCESSORIES
*REG. U. S. PAT. OFF.

ANNOUNCING!

Eureka 100% PURE NICKEL WELDING ELECTRODES

PRODUCE MACHINABLE WELDS ON CAST IRON WITH 100% PURE NICKEL DEPOSITS

1 Have *insulating coatings*, preventing side-arcing.

2 Smooth spatter-free arc action, AC-DC.

3 Emit no injurious gases.

4 Produce smooth bead contours with excellent slag coverage.

5 Give soft, ductile, homogeneous and porous-free weld deposits.

You Be the Judge
ORDER A 5-LB. PACKAGE *Today!*

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Welding Equipment & Supply Co.

MEMBER AMERICAN SOCIETY OF TOOL ENGINEERS

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

225 Leib Street • Detroit 7, Michigan

HELPFUL LITERATURE

FREE Gives properties and recommended procedures for application of heat-resisting alloy electrodes, pure nickel electrodes, copper-nickel alloy electrodes, bronze electrodes, copper electrodes, cast iron electrodes and "Drawalloy" electrodes.

Welding Equipment & Supply Co.
223 Leib Street,
Detroit 7, Michigan

Rush me Bulletin explaining use of Eureka Alloy Electrodes.

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Address_____
Title_____
City_____ State_____

Such scenes as this farmer welding a broken bracket on his disc harrow are filmed in, "Welding Comes to the Farm," a new movie

Lincoln Produces Movie for Farmers

DUE to the interest in arc welding displayed this fall by thousands of farmers at county fairs, the Lincoln Electric Co. has produced a new 16-mm sound-movie, "Welding Comes to the Farm," that shows the farmer some of the advantages of having a welder on his farm for repairing and building machinery. Many ideas are also presented on what can be made from scrap metal when a welder is handy. This 30-minute film may be borrowed free of charge by schools, colleges, granges, 4-H clubs and technical societies.

☆ ☆

Mexican Artist to Portray Lukens' Fabricating Methods

STEELMAKING and fabricating scenes witnessed at the plants of the Lukens Steel Co. and subsidiaries will be used by Artist José Gutierrez as part of a series of murals to adorn the walls of schools of Mexico City. The murals will be painted in auditoriums, foyers, gymnasiums and classrooms in order to familiarize the school children with the various basic industries of the world, including steel.

Senor Gutierrez is director of painting technique at the Instituto de Belles Artes, the leading art academy of Mexico City. His paintings are currently on exhibit in the Cleveland Museum of Art and the Museum of Modern Art in New York City.

☆ ☆

Third Public Hearing on Pressure Vessel Code

A THIRD public hearing on the proposed revision of Section VIII of the Unfired Pressure Vessel Code of the ASME Boiler Construction Code will be held Nov. 19 at 10:00 a.m. in the Engineering Societies Building, 29 W. 39th St., New York City. Purpose of this hearing is to give all those interested in the proposed revision an opportunity to express their comments. Copies of the proposal may be obtained at $1.00 each from the American Society of Mechanical Engineers, 29 W. 39th St., New York City.

Lincoln Foundation Program to Total $6,750 in Prizes

ACTING upon the advice of the deans of engineering of a number of prominent engineering schools, trustees of the James F. Lincoln Arc Welding Foundation have decided to resume the annual engineering undergraduate award and scholarship program. This program was started in 1942 but was interrupted during the war.

The program contains two independent plans: an award plan and a scholarship plan. Under the former, engineering students will submit papers on arc-welded design and the use of welding in maintenance of machines and structures. Seventy-seven prizes totaling $5,000 will be given for these papers.

Under the scholarship plan, scholarships will be allocated to the schools in which the three highest award recipients under the award program are registered. These scholarship awards will total $1,750.

Eligible to submit papers are resident engineering undergraduate students registered in any school, college or university in the United States which offers curriculum in any branch of engineering (including agricultural engineering and architecture) leading to a degree as well as cadets registered in the U. S. Military Academy, U. S. Naval Academy and Coast Guard Academy. A copy of the rules and conditions may be obtained by writing the James F. Lincoln Arc Welding Foundation, Cleveland 1.

☆ ☆

Eutectic Opens Manhattan Plant

FORMALLY opened a short time ago by President R. D. Wasserman, the new downtown Manhattan plant of Eutectic Welding Alloys Corp., at 110 Duane St., provides 37,000 sq ft for production of rods and electrodes, including air-conditioning and dehumidification chambers for flux-coating processes. The building also houses separate laboratory units for basic welding research, metallurgical and chemical control and inspection as well as non-ferrous and ferrous foundries. Batteries of electrode-extrusion presses, wire drawing tables, infra-red drying equipment and baking ovens are laid out for straight-line operation. Production of rods—including 90 different types—is expected to total $10,000,000 annually.

☆ ☆

Liquid Carbonic Completes Oxygen Plant at Buffalo

PART of the $15,000,000 building expansion program of the Liquid Carbonic Corp., Chicago, includes a recently completed oxygen manufacturing plant at Buffalo, N. Y. Under charge of J. J. Kelly, this plant will supply oxygen to users in the medical and industrial fields in this vicinity. The company's expansion program extends into Canada, Mexico and South America as well as in the United States.

SHATTERED FURNACE SHELL REPAIRED

WITH BRIDGEPORT No. 192 LOW FUMING BRONZE

To replace this shattered induction furnace steel shell would have meant a delay of *months*. Yet in a matter of *hours*, it was repaired by *brazing* with Bridgeport's No. 192 Low Fuming Bronze.

This is a typical example of the time-saving, cost-saving advantages of making repairs of broken or worn parts, large or small, with bronze. No elaborate set-up for general heating or stress relieving is required, because *brazing* requires only local preheating to a cherry red.

Often brazed sections are stronger and will outlast the original construction. Bridgeport's Bronze Welding Rod alloys produce exceptionally strong, dense and corrosion-resistant welds.

It pays to braze. Write for our booklet, "Bronze Welding Alloys."

"Bridgeport" BRIDGEPORT BRASS COMPANY
BRIDGEPORT 2, CONN. • Established 1865
Mills at Bridgeport, Conn. and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

WELDING ALLOYS AVAILABLE

BRIDGEPORT No. 192 BRONZE—LOW FUMING
General purpose alloy. Ideal for repairing heavy-duty equipment as well as small parts—building up wearing surfaces—joining parts in industrial and construction work.

BRIDGEPORT BRONZE
Fuses readily at 1625° F. Recommended for uniting cast iron and steel parts—building up wearing surfaces—joining parts in industrial and construction work.

NAVAL BRASS
Not as high in tensile strength as Bridgeport Bronze. Suitable for repairing steel and cast iron—joining piping—building up wearing surfaces.

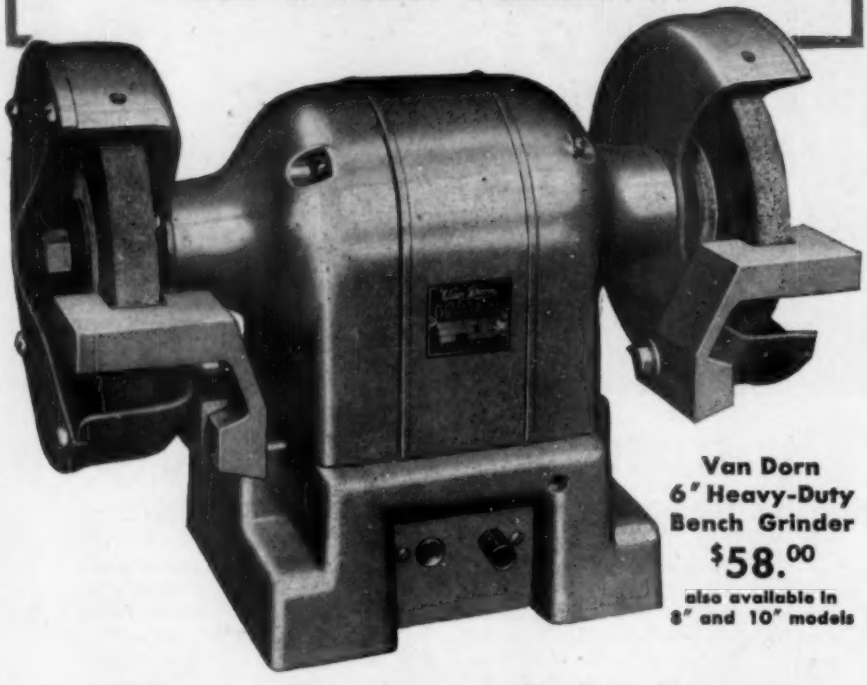
BRIDGEPORT MANGANESE BRONZE (NAVY)
Recommended for strength and toughness in repairing cast iron and steel castings—building up worn surfaces—joining parts in industrial and construction work.

BRIDGEPORT No. 1232 SILICON BRONZE
Used for oxyacetylene, carbon arc or metallic arc welding methods for making silicon bronze storage tanks, automatic heaters, corrosion-resisting ducts, structural sections, vats, etc.

BRAZING ROD
Satisfactory for conditions that are not subject to great wear or heavy shock loads.

Bronze Welding Rod A PRODUCT OF
BRIDGEPORT BRASS

For a Better Welding Surface . . .
For a Finer Finish . . .



Van Dorn
6" Heavy-Duty
Bench Grinder
$58.00
also available in
8" and 10" models

Use a Powerful New Van Dorn Bench Grinder

From start to finish, you can count on a Van Dorn Bench Grinder to help you turn out better welding jobs in less time! Before you start welding, use this handy tool with "Whirlwind"* Wire Wheel Brushes to prepare surfaces for welding by removing rust, scale, old paint . . . with a grinding wheel, to do a speedy job of "V-ing out" the joint to be welded. After welding has been completed, it smooths welds by removing excess metal . . . cleans and buffs the surface for final finishing. Does a fast job of sharpening your twist drills, shears and all other tools, too.

Many new features, including streamlined, die-cast housings for improved working clearances . . . Van Dorn-built, "constant speed" motor . . . steel wheel guards and U-shaped tool rests. Ask your nearby Van Dorn Distributor for details. Write for catalog, showing many other metal-working tools, to: The Van Dorn Electric Tool Co., 734 Joppa Rd., Towson 4, Md.

FOR POWER SPECIFY

*Trade Mark Reg. U. S. Pat. Off.

"Van Dorn"
(DIV. OF BLACK & DECKER MFG. CO.)
PORTABLE ELECTRIC TOOLS

ELECTRIC SANDERS | ELECTRIC DRILLS | ELECTRIC "PORTO-SHEARS"* | ELECTRIC HAMMERS | PORTABLE GRINDERS

Congressional Study of Lincoln Incentive Plan

THE congressional spotlight will be focused this winter on the much-publicized incentive plan of the Lincoln Electric Co., Cleveland. The joint congressional committee set up under the Taft-Hartley Labor Law to watch the operation of this law and to study controversial issues in labor relations plans to examine the Lincoln incentive system and give it more publicity. The study will be in accordance with the committee's mandate from Congress to study "the means by which the individual employee may achieve greater productivity and high wages, including plans for guaranteed annual wages, incentive and profit sharing."

Headed by Senator Joseph H. Ball of Minnesota, the committee will begin hearings in late November or early December. It must report by March 15, 1948, any recommendations for changes in the Taft-Hartley Law or for new legislation in the labor field. The final report is due Jan. 2, 1949, when the next President is preparing his message to Congress.

☆ ☆

Army School Teaches Welding

SHIPFITTERS enrolled in the Army's Transportation School at Fort Eustis, Va., are given specialized instructions in welding and cutting as part of the eight weeks' course which will enable them to become finished shipfitters. The third week of the course is devoted entirely to the study of oxy-acetylene welding and cutting and arc welding. The school is under the direction of its commandant, Brigadier General George C. Stewart.

☆ ☆

Lapeer Takes Over Knu-Vise, Inc.

LAPEER MFG. CO., Lapeer, Mich., has absorbed Knu-Vise, Inc., Detroit, and will take over the manufacture of the company's toggle-action clamping devices which will continue to be made under the trade name "Knu-Vise." Sales offices will remain at the present Knu-Vise Detroit address, 2208 Eighth St. The Lapeer company will be under the management of former Knu-Vise executives.

☆ ☆

National Carbon Buys Carbon Electrode Plant

NATIONAL CARBON CO., INC., New York City, has purchased from the War Assets Administration a surplus carbon electrode plant in Columbia, Tenn., that it operated during the war. The purchase price of $1,637,000 includes eight buildings of brick and wood, machine tools, production equipment, laboratory and testing units, furniture and fixtures, portable tools and dies. The plant is now operating at capacity to meet requirements for carbon electrodes in Europe.

100,000 View Developments at So. Calif. Industrial Show

One hundred and forty exhibitors displayed their wares to some 100,000 persons attending the fourth annual Southern California Industrial Exposition at the Pan-Pacific Auditorium, Los Angeles. After completing its scheduled run of nine days, the show was extended for three days more. In addition to the regular displays of machinery, tools, appliances, supplies, materials, gadgets, services, etc., a 300-ton cyclotron—an atom-smasher in miniature—was exhibited by the University of California. Latest developments in rockets and jet aircraft were also shown.

☆ ☆

Paper Co. Builds Welded Warehouse

Northern Paper Stock Co., Spokane, Wash., is utilizing construction principles invented by the late Lennis A. Kile in erection of a prefabricated warehouse built in an L-shaped pattern. Welded steel girders provide the structure's framework, while corrugated aluminum sheets are employed for the siding and roof. Girders and aluminum sheets were prefabricated to specifications at the Kile Welding Co. shops in Spokane.

Cost of this wholly fireproof building is asserted to be lower than that of a wooden structure of similar design.

☆ ☆

Welding Helps Build Diesel Road Switcher

More than 100 new Alco-G.E. 1,500-hp Diesel-electric road-switching locomotives are operating on or are on order for American railroads. Each of these is being equipped with an 800-gallon welded steel water tank attached to the underframe as well as a welded cylinder block and base. Arc welding is also used in construction of the underframe which is fabricated of steel plates. Truck center plates of cast steel are then welded to the frame and equipped with hardened steel liners. Finally, the superstructure of the locomotive is of welded steel.

☆ ☆

Acetylene Facilities to Expand on West Coast

Industrial Air Products Co., Portland, Ore., recently purchased a 6.2-acre site on which it will build a $50,000 acetylene plant as part of an overall expansion program. The company recently completed a $100,000 addition to its Portland oxygen plant and is planning a new air products plant at Spokane, Wash., to augment its Oregon facilities.

☆ ☆

District Oxygen Moves

District Oxygen Co., Inc., has moved to new headquarters located at 4704 Rhode Island Ave., Hyatsville, Md.

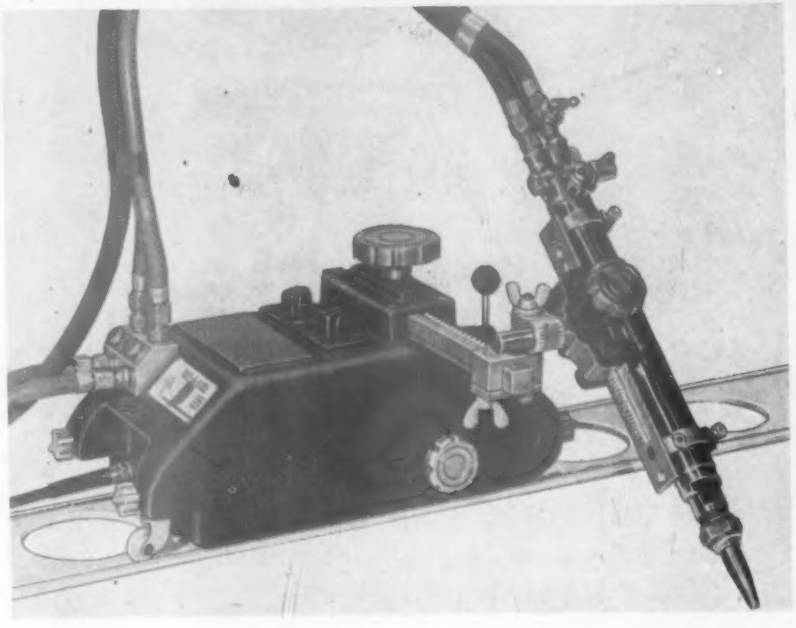
THE

CUT-A-LINE

MODEL 1000

PORTABLE

GAS CUTTING MACHINE



ENGINEERED VERSATILITY

★ The new CUT-A-LINE Model 1000 is designed to provide a machine that is versatile, long lived, and inexpensive to purchase and operate.

Check these features—

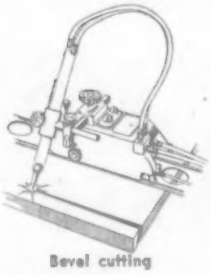
(1) "ONE HANDED" CONTROL — synchronized electrical and clutch control

(2) CONSTANT SPEED up or down hill — torque control

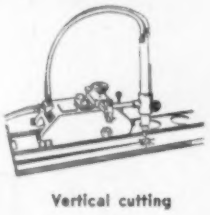
(3) NO OVERHEATING—forced draft ventilation

(4) OPERATES WITH ANY TORCH — hand or machine

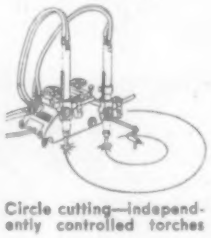
A handy guide containing gas cutting hints and complete information on the Model 1000 is available. Write for yours today.



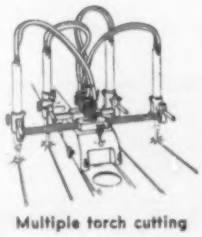
Bevel cutting



Vertical cutting



Circle cutting—independently controlled torches



Multiple torch cutting

INDIANA OXYGEN CO.

435 S. Delaware St. Indianapolis 4, Ind.

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WELDING CABLE

FOR YOUR CABLE REQUIREMENTS

Thousands of hair-fine copper strands, to provide utmost flexibility and maximum conductivity, and a tough vulcanized live-rubber jacket make VICTOR Extra-flexible Welding Cable the leader wherever long life, ease of handling and economy are essential. . .

Remember! . . . Your men and machines are no better than the cable you use.

Available immediately in sizes from #6 to 4/0.

Victor

POWER CABLE

Single and multi-conductor Extra-flexible power lead cable available in all sizes.

DISTRIBUTORS • WRITE FOR DETAILS

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ELECTRIC WIRE AND CABLE CORP.

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FOR BEST WELDING RESULTS USE VICTOR CABLE

Use Radiant Heat for New Hangar

AIRSHIPS landing at Chandler Field, Atlanta, Ga., will now have a warm bed to roll into after their sub-zero flight above the clouds. This is provided by a radiant-heating system concealed in the 120 by 120 ft. concrete floor. The new hangar has seven heating panels, fabricated of more than a mile of 2-in. wrought iron pipe. Temperature variation between floor and ceiling is only one or two degrees. This hangar was built by the Aero Corp., assisted in the design by Stevens & Wilkinson, Atlanta architectural engineering firm.

☆ ☆

Manufacturers' Group Buys Steel Mill

PHOENIX-APOLLO STEEL CO., a syndicate of 25 manufacturers which joined forces less than a year ago, has purchased the Phoenix Iron Co., an ingot producing mill at Phoenixville, Pa., for about $4,000,000.

The mill contains six open hearth furnaces and three rolling mills. After owners' needs have been met, for products ranging from kitchen stoves to lawn mowers, excess steel will be sold to other consumers.

☆ ☆

Great Lakes Carbon Buys Graphite Electrode Plant

GREAT LAKES CARBON CORP. has purchased for $2,000,000 a graphite-electrode plant at Morganton, N. C., from the War Assets Administration. The purchaser expects to lease the plant to the wartime operator, National Carbon Co., for production of special graphite for the Atomic Energy Commission. No commercial carbon products will be produced.

☆ ☆

Larger Plant Planned for U. S. Steel Products Co.

FOUR new buildings totaling over 32,000 sq ft are included in the plans of U. S. Steel Products Co. for expansion of its plant at Dolton, Ill. The company fabricates steel shipping containers used in the packaging and shipping of oils, greases, paints, lard, etc. Both carbon-steel and stainless-steel sheet are used for this purpose.

☆ ☆

Progressive Buys Alloy Casting Plant

IN order to provide a direct source of the heat-treated alloy castings required in the manufacture of resistance-welding equipment, Progressive Welder Co., Detroit, has purchased the Warren Alloy and Machine Co., which operates a non-ferrous foundry in Warren, Mich., and a jig, fixture, die, gauge and punching plant in Detroit. These two plants will be operated as a separate division of Progressive Welder under the name of Warren Alloy & Machine division.

New Distributors

GALV-WELD PRODUCTS, Dayton, O., has appointed U. S. Steel Supply Co., Chicago, as a national distributor for Galv-Weld Alloy, a material for regalvanizing welds made in galvanized sheet, shapes and pipe.

☆ ☆

BANNER WELDER, Milwaukee 9, has appointed: Chicago Welding Sales Co.; State Machine Tool Co., Milwaukee; Cliff Alexander & Associates, Plymouth, Mich.; Hobart Welders Sales & Service Co., St. Louis, and Fusion Engineering Co., Cleveland, as distributors and service points of its entire line of welders and brazers.

☆ ☆

K-G WELDING AND CUTTING CO., New York City 1, has appointed Alloy Welding Sales Co., 4330 S. Ashland Ave., Chicago, exclusive distributor of its welding and cutting products in this area.

☆ ☆

About People

A. F. BOUCHER, welding engineer for The Lincoln Electric Co., has been named district manager for the company's Milwaukee office. Mr. Boucher served in the Army from 1942 to 1945 in the armor and welding section, engineer branch, Office of Chief of Ordnance. He is said to be responsible for many of the late applications of arc welding in the automotive industry. MARSHALL FORD has been made district manager for the Lincoln Minneapolis office. Mr. Ford has been a welding engineer for the company since 1941 and has been active in the development of welding applications in the steel and mining industries.

☆ ☆

MORROUGH P. O'BRIEN, formerly dean of engineering of the University of California, has joined the engineering staff of Air Reduction Sales Co., Inc. Mr. O'Brien is in charge of general and process engineering and assumes the direction of liquefaction research, succeeding DR. FLOYD J. METZGER, resigned.

☆ ☆

O. L. HOWLAND has been appointed sales manager of Metal & Thermit Corporation's welding division, with headquarters in Chicago. During World War II Mr. Howland headed the War Production Board's welding division in Washington. W. C. CUNTZ has been made assistant to Mr. Howland and will be located in Pittsburgh.

☆ ☆

D. A. GRIFFITH has been named assistant general manager of Allis-Chalmers Manufacturing Company's Pittsburgh Works.

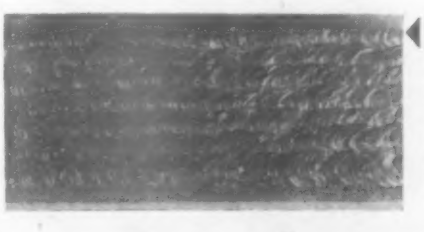
. . . Ampco's New Silicon Bronze Electrode

Permits use of time-saving metallic-arc method in fabricating silicon bronzes. Easy manipulation speeds the work. Less operator skill is required. Sounder deposits are produced. Weld-deposit cracking is minimized.

Sil-Trode is a shielded-arc silicon-bronze electrode operating on reverse (positive) polarity and direct current. It has a spray-type arc action that produces free-flowing slag and weld metal. Spatter loss is low. Deposits are of the highest quality—smooth, dense, crack-free — just the way you want them.

Although Sil-Trode is primarily recommended for metallic-arc welding of silicon bronzes, it is extremely versatile and can be used for welding copper, dissimilar metals, and ferrous-base metals.

Sil-Trode is available in 3/32, 1/8, 5/32, 3/16, and 1/4-inch diameter sizes. Whenever you have a silicon bronze welding job to do, you save time and money with this new silicon bronze electrode. Write today for our latest bulletin giving you complete details.



Here are finish Sil-Trode beads on deep groove weld in silicon bronze plate.

Lap weld with Sil-Trode in 1/2-inch silicon bronze plate.

AMPCO **Ampco Metal, Inc.**

Department WE-11 • Milwaukee 4, Wisconsin

W-103

THE NEW "SUPER DE LUXE" GAS CYLINDER TRUCK "SMOOTHEST TRUCK AFLOAT"

3 MODELS —

CT-500—carries Oxy-Acetylene Cylinders of 100 to 285 cubic feet capacity.

CT-250—carries Oxy-Acetylene Cylinders of 60 to 120 cubic feet.

CT-100—carries Oxy-Acetylene Cylinders of 40 to 60 cubic feet.

STURDILY CONSTRUCTED
ALL-RUBBER TIRED
ATTRACTIVE PRICES
EXTRA WHEELS UPON REQUEST

• • •

EXCELLENT WINDOW SALES APPEAL FOR YOUR GAS AND APPARATUS.
DISTRIBUTOR-JOBBER proposition open some Localities for Key Distributors.

Write today for special quantity discounts.

Manufactured by

NATIONAL WELDERS SUPPLY CO.
Charlotte 1, North Carolina

LENAPE *LOW COST* TYPE R MANWAYS

LENAPE MANWAYS ARE PRODUCED IN STEEL, AND A VARIETY OF STAINLESS COMPOSITIONS

Type "R" Manway

Type "R" Nozzle with Cover

Lenape *Type R Manways* offer decided cost reductions in comparison with American Standard Manways of similar rating. Produced to meet ASME Code requirements, these seamless manways are available in heavy type (200 psi) and light type (125 psi) with 16", 18", 20", and 24" openings as standard. Both heavy and light types can be supplied "long" (12" height) or "short" (5" to 8" height) depending upon opening diameter. Slightly curved radius makes for easy entry. Dished covers are available. Swing covers, davits, and similar special details can be supplied for Manway service.

Lenape Type R Nozzles are supplied of heavy or light as above, in short model only. These nozzles are curved to cylindrical diameter or spherical radius as specified.

Quotations will be given our immediate attention — Bulletin 4-61 and current price schedule M-47 will be sent upon request.

LENAPE HYDRAULIC PRESSING AND FORGING CO.

LENAPE HYDRAULIC PRESSING & FORGING CO.
DEPT. 104 WEST CHESTER, PA.

L. W. HAYDEN has been named resident vice-president of Lindberg Engineering Co., New York City. He will be in charge of all East Coast sales offices including Boston, Hartford, Philadelphia, N. Carolina and New York. Mr. Hayden will also be in charge of all export sales. Other company appointments include: G. W. HELSBERG, in charge of the Boston office; R. W. DOUGHERTY, in charge of a new Lindberg office to be opened in Philadelphia; S. K. OLIVER moves from New York to the Cleveland office and T. M. LA CRONE, formerly with General Motors, has been placed in charge of the Kalamazoo, Mich. office.

☆ ☆

CHARLES G. HERBRUCK, formerly employed in the welding industry; planning and developing welded designs and the science of welding, has been appointed assistant secretary of The James F. Lincoln Arc Welding Foundation. Mr. Herbruck brings to the Foundation first hand experience in using the technical advances in welding to reduce production costs and to increase flexibility in production of machinery to raise the standard of living.

☆ ☆

CHARLES R. HOOK, president of the American Rolling Mill Co., Middletown, O., recently received the American Society for Metals "Medal for the Advancement of Research for 1947." Mr. Hook has consistently sponsored metallurgical research or development, and by his foresight and influence in making available financial support has helped substantially to advance the arts and sciences related to metals.

☆ ☆

JOHN L. PEET has retired as division superintendent of maintenance at the Carnegie-Illinois Steel Corporation's Gary Sheet & Tin Mill. IRVING PAUL, superintendent of the 80 in. hot strip department succeeds Mr. Peet. BRAD C. GAMBLE has been promoted assistant general superintendent of this department. WILLIAM P. JONES succeeds Mr. Gamble as superintendent of industrial relations.

☆ ☆

C. F. WILEY has been promoted assistant manager of the Chicago district sales office of American Steel & Wire Co. Mr. Wiley will share in the responsibility of all phases of the wire company's sales in the Chicago area. BRUCE D. BENNETT succeeds Mr. Wiley as manager of the electrical, wire rope and construction materials division, Chicago.

☆ ☆

EDGAR J. REICHENBACH has been appointed manager, specialties and machinery division of the general sales department of the U. S. Steel Supply Co. He will make his headquarters in Chicago.

☆ ☆

EDWARD J. MALVEY has been promoted advertising manager of the Chase Brass & Copper Co., Conn.

DID YOU KNOW...

"130X" electrode will weld Monel to steel? (See page 5)

Ni-Rod makes strong, sound, machinable welds in cast iron. (See page 10)

You can overlay Nickel on cast iron with "131" Nickel electrode. (See page 5)

No. 41 Monel gas welding wire is best for welding Inconel to steel. (See page 13)

No. 50 Monel wire is recommended for submerged melt welding of Monel. (See page 16)

You get these facts... and many more in this

FREE GUIDE to BETTER WELDING

You've probably wished someone would present . . . in simple, convenient form . . . the complete list of INCO Welding Materials, together with the job that each one will do.

The booklet shown above gives you exactly that information.

Here, for example, is what INCO electrode to use when joining cast iron to steel, or to Monel* or Nickel. You'll find tables which tell the proper electrodes to select when joining many similar and dissimilar materials.

There's also a section on making overlays . . . and one on joining clad steels.

As a further help, you'll find recommended amperages for each electrode.

If you're a gas welder, there's a section that deals with the wires and fluxes to use when gas welding Monel, Inconel*, Nickel, and steel.

Listed also are the INCO wires to use for submerged melt welding of Monel, Nickel, and Inconel.

Send for this booklet today. You'll find it a convenient guide to better welding . . . more economical production and repair. For free copy simply fill in and mail the attached coupon. *Reg. U. S. Pat. Off.

Mail the attached coupon today ➡

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

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- One piece, molded, sturdy fibre construction.
- No rivets to tear, loosen or burn out.
- No possibility of electric shock.
- Deep molded design for maximum protection.
- Absolutely light-proof.
- Unusually comfortable.
- Quick adjusting, molded fibre headgear.
- Easily cleaned and sterilized.
- Available with quick change, coverplate, metal lens holder.
- Also available in handshield and lift-front types.

MODEL M-1250

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WELDER'S HELMET

Practical, high quality protection. Dockson designed for maximum comfort, safety and economy.

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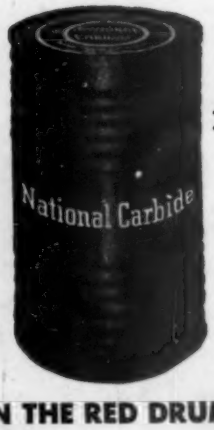


NATIONAL CARBIDE IN THE RED DRUM

Write us for information as to nearest available stock.

NATIONAL CARBIDE CORPORATION

60 E. 42nd St., New York 17, N. Y.

L. M. DALCHER, formerly technical secretary of the American Welding Society, has joined Fairbanks, Morse & Co. as standards engineer in the newly-organized standards department of the company.

☆ ☆

C. LOUIS MEYER, founder of Ceco Steel Products Corp. and formerly president, has been named to the new position of chairman of the board. Ned A. OCHILTREE, formerly executive vice-president, succeeds Mr. Meyer as president of the firm.

☆ ☆

NELSON J. LEONARD has been placed in charge of the Elwell-Parker trucks, tractors and cranes account for the Colby Steel & Engineering Co., Seattle. He brings to this position a broad knowledge of materials handling acquired during World War I and II and during his civilian activities.

☆ ☆

DR. FREDERICK SEITZ and DR. ROMAN SMOLUCHOWSKI of the Carnegie Institute of Technology, have been appointed members of the newly organized Committee on Solid State in the division of physical sciences of the National Research Council.

☆ ☆

W. C. SHERWOOD, JR., formerly district manager for National Cylinder Gas Co. in the Memphis territory, has been appointed general sales manager of Delta Oxygen Co., Inc., Memphis, Tenn.

☆ ☆

CLARENCE C. DEHAVEN, formerly of Drexel Institute, Philadelphia, is now at Ohio State University as assistant professor of welding engineering. He replaces J. R. STITT, who has accepted a position with an industrial concern.

☆ ☆

NORMAN B. JOHNSON has been appointed to the newly created post of assistant executive vice-president of Pullman-Standard Car Mfg. Co.

☆ ☆

Died

DR. WILLIAM E. WICKENDEN, retired president of Case School of Applied Science and more recently named representative for the Engineers Joint Council on the United States Commission for United Nations Educational, Scientific and Cultural Organization, died suddenly Sept. 1, at Peterboro, N. H.

☆ ☆

RAYMOND R. RIDGWAY, associate director of research, Norton Co., died June 12, at Niagara Falls, N. Y. Mr. Ridgway has been responsible for many inventions as well as improvements in the design of electric furnaces for the production of abrasives, improvements in the manufacture of fused alumina, silicon carbide and magnesia.

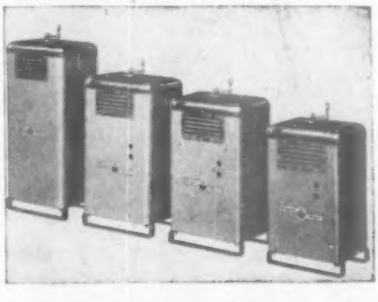
New Products to Use

AO R-200 respirator has a new throw-away type filter only ⅛ in. thick

Dust Respirator

A NEW dust respirator incorporates a dust filter for protecting industrial workers exposed to poisonous dust particles of smaller diameter than 24 millionths of an inch. The filter is ⅛ in. thick and slightly over 5 sq. in. in area; it consists of a felt chemically treated so that its ability to prevent the passage of dust is 40 times greater than untreated filters. A gauze pre-filter catches larger particles of dust and dirt before they reach the felt. AMERICAN OPTICAL CO., Southbridge, Mass.

☆ ☆



The "65 line" of a-c welders includes five ratings. Left to right: 500, 400, 300 and 200 amp models

Low-Voltage Welders

THE "65 line" of Westinghouse a-c welders derives its name from the open-circuit voltage. New engineering features are said to assure high arc stability in the lowest as well as the highest current ranges of the five output ratings—200, 300, 400, 500 and a duplex 300/600 amp. Built-in low-voltage control and built-in capacitors assure efficiency in the low-current range and high power factor, respectively. Reactor and transformer are built around high-permeability "Hipersil" steel cores. WESTINGHOUSE ELEC. CORP., P. O. Box 868, Pittsburgh 30.

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Leads the Field!

FASTER WELDS

LOWER COSTS

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HIGH POWER FACTOR

NO "MAGNETIC BLOW"

WIDE WELDING RANGE

BUILT-IN CAPACITOR

MARQUETTE "Instant Arc" A.C. WELDERS

. . . the answer to your Production Problem. Instant Arc Striking speeds welding on light gauge welding because it's so easy to strike and hold the arc.

. . . the answer to Lower Costs. Welding eliminates much costly drilling, tapping, riveting, etc., and makes a stronger finished product. (Lighter product cuts shipping costs, too!)

. . . the answer to Power Requirements. Models 262 C and 261 C are Capacitor Equipped for High Power Factor. Enables you to operate more equipment off single line.

. . . the answer to all Maintenance Jobs. Wide Welding Range of 20 to 275 amperes takes all jobs in stride. Truck Mounted for quick, easy mobility. Ideal for building low cost trucks, racks, bins, etc.

. . . the answer to Tool and Die Work. Make low cost dies of low carbon steel and Hard-surface the cutting edges. Repair broken tools and cutters without dismantling.

Model 262 C Telnic Bronze plugs and sockets doubles current carrying capacity in high heats. Special transformer design for "Instant Arc Striking" *without* high frequency or booster gadgets. Models: 262 and 262 C (with capacitor) 20-275 amps.: 261 and 261 C (with capacitor) 20-200 amps. 8 additional models 125 to 400 amps.

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Welding EQUIPMENT

A.C. ARC WELDERS ELECTRODES
ACETYLENE GENERATORS ACCESSORIES
OXY-ACETYLENE WELDING & CUTTING EQUIP.

MARQUETTE MFG. CO., Inc., Minneapolis 14, Minn.

from FLAT SURFACES TO INTRICATE SHAPES with the New DI-ACRO BRAKE

- ROK-LOK—new sensitive material clamp increases accuracy
- DOUBLE-EDGED FORMING BLADE allows close reverse bends
- NEW PRECISION STOPS accurately control angularity of bends

This versatile metal forming machine was developed for use in model shops, experimental laboratories and production departments where it often replaces dies for all types of precision forming operations. Di-Acro Brakes will form a great variety of materials including bronze, stainless steel, aluminum and bi-metals.

WRITE FOR CATALOG. New edition of 40-page Di-Acro Catalog contains detailed information on all Di-Acro Brakes, Shears, and Benders and illustrates how these precision machines can be used individually or cooperatively for "DIE-LESS DUPLICATING".

◀ DI-ACRO is Pronounced "Die-Ack-Ro"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

385 8TH AVE., LAKE CITY, MINNESOTA

High Strength Machinable Welds In Cast Iron . . .

EASIER . . . FASTER . . . CHEAPER

Talk about sound, strong, machinable welds in cast iron Here's a way to get 'em . . . *but fast* . . . every time. Use Ni-Rod* electrodes"

Ni-Rod's easy-to-control arc speeds up all kinds of cast-iron repair work. Cuts labor, time, and costs. Raises welders' success scores on tough jobs.

Ni-Rod gives you thorough fusion . . . close color match . . . smooth bead that sheds slag. Works on A.C. or D.C.

Stocked in 3/32", 1/8", 5/32" and 3/16" sizes. Order a 5-lb. package today.

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Detroit 10, 5151 Wesson Ave.	Milwaukee 4, 647 W. Virginia St.
St. Louis 10, 4505 Mc Ree Ave.	Minneapolis 15, 529 S. 7th St.

SEND FOR FREE INSTRUCTION BOOKLET

Argon welder for welding aluminum, magnesium and beryllium copper

Argon Welder

WELDING of aluminum, magnesium and beryllium copper in an atmosphere of argon without the use of flux is facilitated by a new 220-440 volt a-c welding transformer especially designed for the inert-gas arc process and suited to either manual or machine operation. The welding unit includes capacitors for power-factor correction, a bank of series capacitors to stabilize the arc and a pilot spark circuit for arc starting. The entire assembly is enclosed in a drip-proof case.

An indicator scale on the front of the welder shows the current setting, which is controlled by a handle on top. Once adjustments are made, all components are operated by a foot treadle, thus allowing the weldor to devote his entire attention to the work.

Gas and water values may be operated independently to purge the gas lines of air before welding begins. This prevents the wild, uncontrollable arc resulting from air inclusion in the gas line and lengthens the life of the tungsten electrode by preventing oxidation.

Welders are available with or without a three-wheel running gear for portability. GENERAL ELECTRIC Co., Schenectady 5, N. Y.

☆ ☆

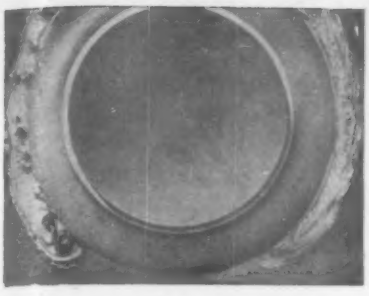
Sheet Metal Leveler

THIN-gauge metals can now be flattened satisfactorily by a new "inverted-type" roller leveler capable of pressing sheets from 0.010 in. to 0.030 in. thick and up to 28 in. wide. All controls are from levers mounted on top of the machine with a hand-wheel below them. The lower flight of ¾-in. diameter work rolls is tiltable and not the upper flight. VOSS MACHINERY Co., 2882 W. Liberty Ave., Pittsburgh 16.

☆ ☆

Correction:

IN THE September, 1947, issue of THE WELDING ENGINEER, the New Product item, "Welding Tips" (page 89), was mentioned as being produced by the Keating Mfg. Co. The company's name is the KEATON MFG. Co., Butler, Wis.



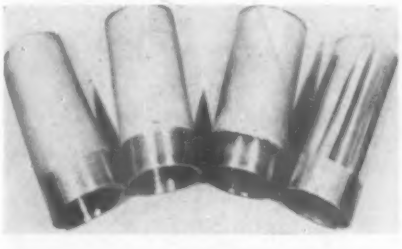
This cold-rolled steel plate shows a weld made with a conventional electrode (left) and with an Airco 312, right

All-Position Electrode

RECOMMENDED uses for the improved "Airco 312" electrode are: welding high sulphur free machining steels; welding hardenable steels where no preheat is used; welding cold-rolled steels which normally exhibit excessive porosity when welded with conventional electrodes; welding steel to be vitreous enameled after welding. The extreme low-hydrogen content makes possible the production of satisfactorily enameled surfaces without heat treatment prior to enameling.

Two advantages of this new all-position, mild-steel electrode over its predecessor are: (1) It works equally well on either a-c/d-c reverse polarity current. (2) Preheating of electrode is no longer required to obtain porosity-free weld deposits. Such deposits can be obtained by using either the stringer bead or the full weave technique. AIR REDUCTION SALES CO., INC., 60 E. 42nd St., New York City 17.

☆ ☆



Four stages of "Metco-Weld H." Left to right: preparation, spraying, fusing, finishing

Hard-Facing Wire

A NEW metallizing wire, "Metco-Weld H," is manufactured by extruding a powdered hard-faced alloy with a plastic binder to aid in applying smooth coatings to metal surfaces. During the spraying operation, the plastic binder is completely volatilized, and the deposit consists entirely of the alloy. Subsequent heating with a torch or other heating method results in a coating alloyed to the base, physically and chemically identical to hard-facings of the same alloy applied by other methods. It possesses excellent resistance to abrasion, will outwear hardened steel three to ten times, has high strength at red heat and good resistance to oxidation, states manufacturer. Metco-Weld H combines a low melting point with a long range of plasticity (1,850 to 2,050 F). METALLIZING ENGINEERING CO., INC., 38-14 30th St., Long Island City 1.

CHEK-SHOCK OXYGEN CUSHION VALVE

SOFTLY controls the vicious "jolt" of high pressure oxygen gas, thus eliminating regulator repairs and preventing possible injury to operators.

- Will allow tank valve to be opened rapidly without damage to regulator or danger to operator.
- Will increase life of regulator assembly.
- Will eliminate possible injury to operator from burstings.
- Will prevent unnecessary internal wear in regulator (*as NOT necessary to release control screw before opening tank valve*).

PRICE IS LESS THAN ONE REPAIR BILL ($6.00 EA.)

#1. STANDARD COUPLER . . . for all standard size welding type oxygen regulators.
#2. LIGHT COUPLER . . . for "airplane" or soldering size oxygen regulators.
#3. HEAVY DUTY COUPLER . . . recommended for extra heavy duty work only.
#4. SCREW TYPE COUPLER . . . for removable inlet stem regulators (¼" pipe) available in standard, light, or heavy capacities.
#5. FOR HYDROGEN . . . left hand thread coupler.

We also Make MEDICAL CHEK-SHOCKS for All Types of Medical Regulators and Tank Fittings (chrome plated)....$8.00 Ea.

SEE YOUR DISTRIBUTOR OR WRITE—

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FOWLER, CALIF.

Weldimatics

WELD IT WITH WELDIT PRODUCTS

WELDING TORCH W-45
Strong and sturdy, 14 inches long, yet weighs only 17 ounces. Lock control for continuous welding. Cuts oxygen and acetylene costs one-third.

BLOWPIPE C-47
Aluminum alloy construction... good balance, comfortable grip. Closed hand releases gas . . . open hand cuts it off. Reduces idle flame fire hazard. Works perfectly with natural gas, manufactured gas, butane and compressed air.

WELDING TORCH W-46
Has long lever for closed hand or fingertip gas control, allows wider operating range. Weight, 14 ounces; length, 13 inches.

Meet all Underwriters Requirements

Weldimatics

. . . are daily cutting costs, reducing fire hazards in many of the world's largest industrial plants. Some distributor territory still available. Write today for descriptive bulletin.

994 OAKMAN BLVD. Weldit INC. SINCE 1920 DETROIT 6, MICH.

HARD SURFACING *for* *Body Protection*

When abrasion, corrosion, galling impact or erosion threaten the life of parts and tools, build up and protect surfaces with MIR-O-COL, the hard-surfacing welding rod. MIR-O-COL is the specialist in hard-surfacing with

SIX Different Rods for SIX Applications

NO. 1—for hard, thin welds.
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NO. 3—shatterproofing and tough.
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NO. 5—to resist heat, oxidation and corrosion.
NO. 6—non-ferrous—resists heat and corrosion.

Write today for free booklet, "Welder's Guide to Successful Hard-Facing."

WHITEHEAD METAL PRODUCTS COMPANY, INC.
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Philadelphia—Newark—Buffalo—Boston—Baltimore—Syracuse—New Haven—Rochester—Albany

Headquarters also for aluminum, brass, nickel alloy, NI-ROD and steel welding rods.

"FLUXINE" Fluxes are the result of over fifty years of scientific research into the metal-joining field. There are 89 FLUXINE Fluxes . . . one for every welding, silver soldering, brazing, and soft soldering operation . . . each with its own properties, designed for a particular metal-joining operation. All have been perfected not only for highest efficiency, speed, and long life, but for economy and safety as well. FLUXINE Fluxes cause no injurious fumes to irritate eyes or nose of the operator.

So confident are we that wherever a metal-joining operation is required FLUXINE Fluxes will do it better, faster, and more economically than any competitive fluxes, that we will be glad to have you try it at our expense.

Write on your company letterhead for a generous sample stating which FLUXINE Flux you desire.

Ask your jobber for Fluxine Fluxes . . . he knows the FLUXINE line produces the best results with the greatest economy.

KREMBS & COMPANY
Est. 1875
Dept. G, 669 W. Ohio St., Chicago 10, Ill.

FLUXINE
TRADE MARK REGISTERED U. S. PAT. OFF.
FLUXES TO JOIN ALL METALS

"Wheelrite, Jr.," cylinder truck of all-welded steel construction

Cylinder Truck

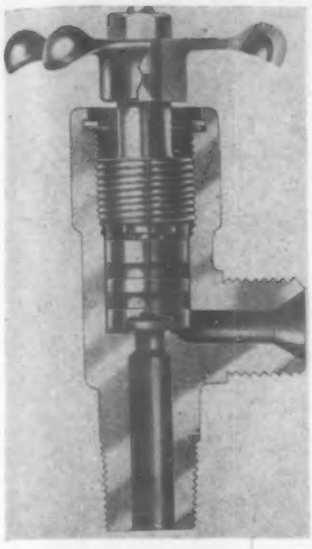
AN ALL-WELDED truck weighing under 20 lb is offered for handling small Q-oxygen and W.Q. acetylene tanks for passage through small areas and aisles. Its tubular steel frame measures 8⅝ in. wide by 15 in. long and stands 40 in. high at the back. The two wheels are faced and cushioned with tires of neoprene, a substance highly resistant to oils and chemicals and rolls on self-lubricating bearings. A chain is included to hold cylinders in place on the one-piece steel platform. WELDRITE CO., INC., 29-23 40th Rd., Long Island City 1.

☆ ☆

Photographic Paper

A SILVER-SENSITIZED paper for reproducing engineering drawings on blue print or direct-process equipment produces a positive copy directly from a positive original. It embodies a new type of emulsion which permits its use in normal room light and is said to combine the advantages of contact printing with the high contrast previously obtainable only through the use of the process camera. Copies produced on it may be used as printing intermediates or "master" to make blueprints or diazos. They are also of value as field copies because of the long life of the photographic image. Worn, discolored or opaque engineering drawings may be reproduced without redrafting on the new "Kodagraph Autopositive" paper.

Supplied in standard sheet and roll sizes, Kodagraph Autopositive is one of four new papers for engineering reproduction and office-copy use. The other papers are: "Kodagraph Contact," intended for photocopying of forms, charts and drawings on conventional contact equipment, especially where a negative is required, and "Kodagraph Projection" and "Fast Projection," for use in making enlarged prints from microfilm or other reduced-scale negatives. EASTMAN KODAK CO., Rochester 4, N. Y.



"SE-CO" oxygen and acetylene cylinder valve has many safety features

Cylinder Valve

FREEZING in either the open or closed position is said to be impossible with the new "SE-CO" packless stem valve for oxygen or acetylene cylinders. This, together with the impossibility of disassembling the valve by turning the spindle past the open position, eliminates the possibility of a weldor accidentally backing the spindle out of a valve in service on a cylinder or line containing gas at high pressure.

Equipped with Neoprene "O" rings and a Neoprene seat, the valve also has a heavy-duty forged brass body and a full-grip hand wheel. It weighs 1.35 lb and is 4½ in. high open. Operating pressures are 1 oz to 3,500 psi; temperatures, 70 to 250 F; maximum open or close torque, 35 in.-lb. SECURITY VALVE CO., 410 San Fernando Road, Los Angeles 31.

☆ ☆

Wear-Resistant Rod

AIRCO No. 28, a wear-resistant bronze welding rod, has particular application in the railroad field for building up wear resistant surfaces subject to heavy loads and elevated temperatures. It may be used for building up worn piston heads, valve bull rings, driving box laterals, shoes, wedges, etc.

Test results show that deposits made with this rod possess high weld strength, wear and corrosion resistance and a hardness averaging 86.5 Rockwell B. AIR REDUCTION SALES CO., 60 E. 42nd St., New York City 17.

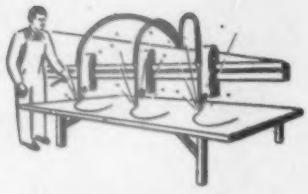
☆ ☆

Low-Resistance Tester

MODEL 670-C linear microhmmeter is said to be ideal for testing multi-strand cables on the moving arms of resistance-welding equipment to determine whether or not any strands have been broken. This 10-lb unit operates from two No. 6 dry-cell batteries and has a full scale range in microhms: 1,000, 5,000, 10,000, 50,000, 100,000 and 500,000. SHALLCROSS MFG. CO., Collingdale, Pa.

FOR THESE JOBS . . .

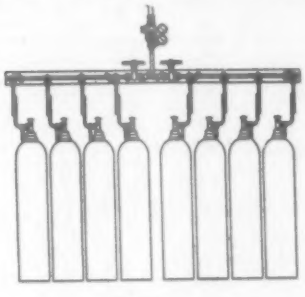
Production Welding



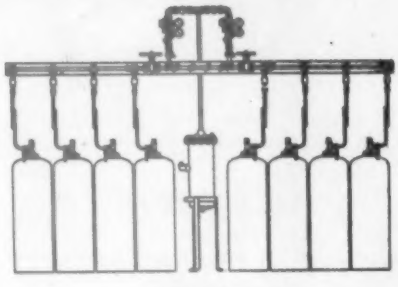
Production Cutting

. . . and operations such as welding and cutting heavy sections with hand torches, flame hardening and softening, flame cleaning . . . also any installation where a battery of cylinders is required.

YOU NEED THESE MANIFOLDS . . .



REGO
Oxygen Manifold



REGO
Acetylene Manifold

BECAUSE OF THESE ADVANTAGES . . .

- *Added Convenience* . . . Individual shut-off valves at each cylinder station permit the removal of any cylinder without shutting down one side of the manifold. Master shut-off valves control flow of each bank of cylinders.
- *Unit Construction* . . . Header assembly, mounted to steel I-beam, is virtually one piece. Extra-heavy pipe is run through header fittings, cylinder station shut-off valves and master shut-off valves, with all permanent connections silver-brazed.
- *Precision Regulation* . . . Uniform delivery pressure is assured by large capacity two-stage Regolators.
- *Exacting Tests* . . . Every RegO Manifold is subjected to a sustained air pressure test before shipment.

REGO* Manifolds for Oxygen . . . Acetylene . . . Hydrogen . . . Nitrogen and other high pressure gases.

*Reg. U. S. Pat. Off.

The BASTIAN-BLESSING Company

4201 W. Peterson Avenue Chicago 30, Illinois

Pioneer and Leader in the Design and Manufacture of Precision Equipment For Using and Controlling High Pressure Gases

Greyhound's NEW POWERIZED VARIABLE CORE ARC WELDER

(Operates on 110 to 120 Volts A. C. Current)

Model N110 uses up to 1/8" welding rod

WELDING • BRAZING • SOLDERING

ON ALL METALS
FERROUS — NON-FERROUS

AN IDEAL WELDER FOR SERVICE STATIONS — GARAGES — SHEET METAL SHOPS — BLACKSMITH AND WELDING SHOPS — FARM USE — HOME CRAFTSMEN

- This new Greyhound Welder is not to be confused with other so-called small welders that operate on 110 Volts A.C. Current. This new welder is guaranteed for continuous operation, not merely for intermittent welding service.
- "Stepless" current selections with a turn of a control wheel approximately 40 heat stations.
- Adjustments may be made without interrupting the arc.
- The transformer coils are wound with burnout proofed spun glass insulated magnet wire-mica and glass tape insulation used throughout.
- The transformer in this new welder is of the same construction as our world known Heavy Duty Industrial and Farm Welders.
- Welding of light and medium gauge metals amazingly simple even for beginners.
- Guaranteed against defective workmanship and materials for a period of one year.

Manufactured by

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Export Department: 75 West Street, New York 6, N. Y., U. S. A.
Cables: "Davtex Coe" New York

You Can't Beat The EXPERT Outfit for General Welding

IDEAL FOR DAILY USE IN—

Garage and body shops, cooking utensils and sheet metal plants, airplane factories—wherever general welding is done.

Here's an outfit that has proved its efficiency and economy of use in thousands of shops all over the country. Each unit has been especially designed and selected to provide an outfit complete for every light welding requirement. Adaptable for oxygen, acetylene and hyrdogen gas, for sheet or fabricated metal—ferrous or non-ferrous. We'll be glad to tell you more about this outstanding outfit.

What Equipment are YOU using Now? Meco **Write us for the Address of Your Nearest Distributor**

MODERN ENGINEERING COMPANY, INC.

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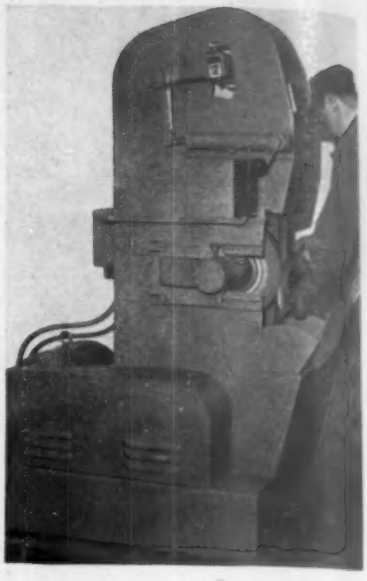


Porter-Cable's new belt grinder to grind-polish contours

Flexible Belt Grinder

GRINDING and polishing of contours is now possible with a new flexed abrasive belt that drapes itself into the pattern on the contact roll. The contact roll is specially made of sisal and latex to hold a pattern indefinitely and also be slightly resilient for smooth, fast grinding.

The "C-6" belt grinder occupies a space 26 in. by 38 in. and accommodates a 48-in. abrasive belt. Its contact roll is merely an idler, and hence the surface speed of the belt remains constant regardless of the diameter of the contact roll. PORTER-CABLE MACHINE CO., 1714 N. Salina St., Syracuse 8, N. Y.

☆ ☆

Stainless-Clad Steels

NEW stainless-clad steels offered by LUKENS STEEL CO., Coatesville, Pa., consist of a layer of stainless steel permanently bonded to a backing plate of carbon or low-alloy steel. This process is said to give in the corrosion resistance of stainless plate at appreciable savings in cost over solid stainless. The base metal is usually carbon steel, but may be any low-alloy steel of flange or firebox quality.

The cladding is normally specified as a percentage of total plate thickness and is generally 10 or 20% but can be furnished from 5 to 50%. The cladding thickness may also be specified, such as 0.050 in., regardless of total plate thickness.

☆ ☆

Nickel Electrode

"EUREKA No. 100," a pure-nickel electrode for repairing cracked, broken, worn or defective castings, is said to produce a stable, spatter-free arc with perfect slag coverage of weld deposits. The resultant welds are soft, ductile, sound, homogenous and porous, states manufacturer. An insulating coating, free of fluorides, eliminates injurious gases. WELDING EQUIPMENT & SUPPLY CO., 223 Leib St., Detroit 7.

Hobart's new engine-driven welder and power plant brings a-c welding to the farm not served by power lines

Engine-Driven A-c Welder

POWER lines are no longer necessary for a-c welding. Instead of the usual transformer-type welder, Hobart offers a 200-amp engine-driven a-c welder and home power plant combination. A changeover switch converts the welder generator into a 120-volt, 60-cycle, single-phase power plant capable of operating up to 5 kw. This handy farm combination is available either with or without the gasoline engine driving the generator. THE HOBART BROTHERS CO., Hobart Square, Troy, O.

☆ ☆

Silicon-Bronze Electrode

"SIL-TRODE," a new coated silicon-bronze electrode has been developed to meet the needs of welding engineers who prefer to use an electrode of composition similar to the parent metal when fabricating and repairing parts of silicon-bronze material. This electrode operates on reverse-polarity, d-c, and its coating gives a spray-type arc action. Spatter loss is low and deposit free of cracks, states manufacturer.

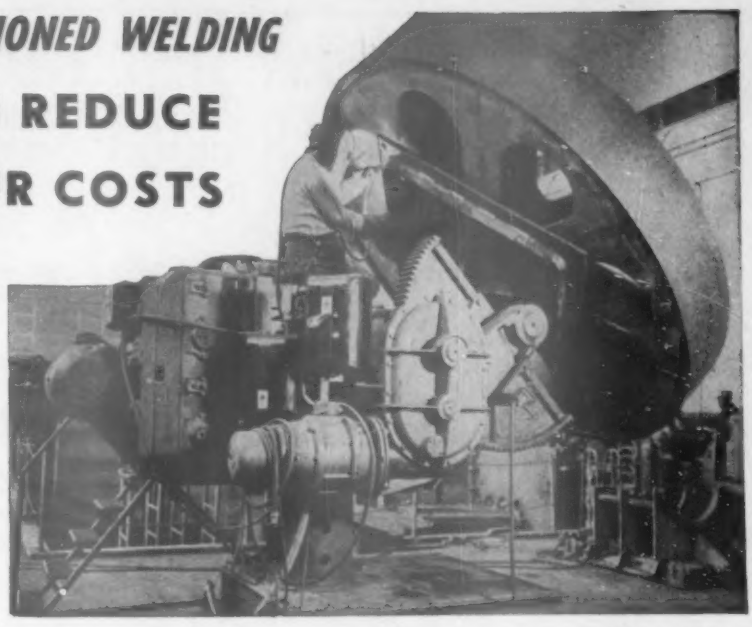
"Sil-Trode" is recommended for welding silicon bronzes, copper, dissimilar metals and ferrous base metals. This electrode conforms to the proposed AWS-ASTM specification E Cu Si and is available in 3/32, 1/8, 5/32, 3/16 and 1/4 in. diameters. AMPCO METAL, INC., 1745 S. Thirty-eighth St., Milwaukee 4.

☆ ☆

Electric Furnace

CONTINUOUS operation at 2,000 F and accurate temperature control down to 300 F are two claims of the model "V-5" automatically controlled electric furnace. Suitable for heat-treating stainless and air-hardening steels and such small parts as tools and dies, the furnace raises the temperature of the part from cold to 2,000 F in 1½ hours. It may also be used for normalizing, annealing, carburizing and hardening in the range of from 1,200 to 2,000 F. An electronically-operated pyrometer is employed. COOLEY ELECTRIC MFG. CORP., Indianapolis, Ind.

POSITIONED WELDING CAN REDUCE YOUR COSTS



Because C-F Welding Positioners make every weld a downhand weld, your welding time and cost is cut to a minimum. Positioned welding permits use of larger electrodes—fillets of correct width and depth can be laid in one pass, with resulting time and material saving PLUS better welding. C-F Positioners, with Variable Speed table rotation in any range from 0 rpm and up provide greater flexibility of positioner use in all types of automatic or hand welding. Like all C-F Positioners, these power operated models tilt 135° from the horizontal and full 360° table rotation is possible at any angle.

Investigate the definite cost-saving advantages of C-F Power or Hand Operated Positioners. All models have either variable or constant speed control of table rotation. Write for Bulletin WP.

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And after all, who'd want to change those lips? But if you're thinking of rebuilding bucket lips, (or tractor grousers, jaw, gyratory, roll and cone crushers) make a bee-line for MANGANAL APPLICATOR BARS. Choose rolled rounds, squares, flats or special shape. And start your build-up with MANGANAL BARE or SPECIAL TITE-KOTE WELDING ELECTRODES.
NAME OF NEAREST DISTRIBUTOR UPON REQUEST.
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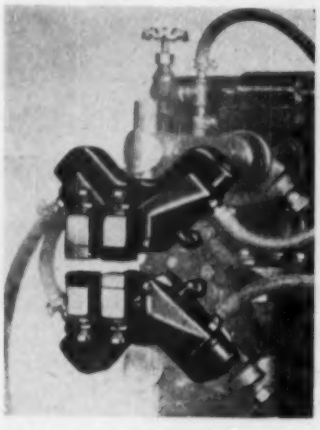
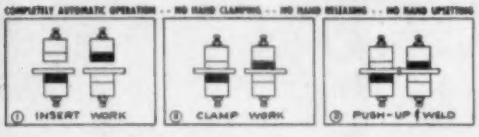
91 N. J. Railroad Avenue, NEWARK 5, N. J.

. . . . MAKE YOUR SPOT WELDER
A BUTT WELDER IN 2 MINUTES SIMPLE • INEXPENSIVE



HOFFMAN
BUTT-ON-SPOT
AUTOMATIC BUTT WELDING ATTACHMENT


COMPLETELY AUTOMATIC OPERATION - - NO HAND CLAMPING - - NO HAND RELEASING - - NO HAND UPSETTING
① INSERT WORK
② CLAMP WORK
③ PUSH-UP f WELD

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USERS
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Write today for information on this time-saving, money-saving attachment.

★ The Hoffman Butt-On-Spot Attachment is a water-cooled, *completely automatic* butt welding attachment designed to fit any spot welder having a minimum horn clearance of 7"—manual, air operated, or motor driven.

Maximum capacity dependent on welder KVA capacity but recommended maximum is ⅜" dia. round stock, 5/16" square stock, and ⅜"x¾" rectangular stock.

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Weld White Metal
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Solder and Braze Aluminum
Easily and Quickly
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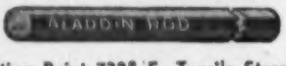

Melting Point 732° F. Tensile Strength lbs/Sq. in. 47,300. Shearing Strength lbs/Sq. in. 45,800. Meets Air Corps Specification No. 10302. Instructions with every pound. Sizes 1/32", 1/16", 1/8", 3/16", 1/4", and Complete Assortment.

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electrodes for atomic hydrogen, helium and argon arc welding

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Station outlet valve eliminates back up pressure in case of fire

Station Outlet Valves

RECOMMENDED for use on drops or risers of a welding piping system is a ½-in. station outlet valve that combines the functions of a shut-off and check valve. As a shut-off valve, it permits repairs or alterations to be made on equipment downstream from the valve without disturbing other stations; as a check valve, it allows the flow of gas in only one direction and will close tightly should a disturbance at the torch cause a back pressure. The valve is of the diaphragm type, and, being "packless," it has no stuffing box. Several outlets can be connected to one service drop, each outlet independent of the others. Am. REDUCTION SALES CO., INC., 60 E. 42nd St., New York City 17.

☆ ☆

Projection welder for assembling main bodies of typewriters

Projection Welder

A NEW high-production projection welder has been developed. The first unit delivered is now welding retaining strips and other subassemblies to the steel stampings forming the main body of typewriters. This machine, now in volume operation at a large eastern typewriter manufacturer, produces approximately 200 completed assemblies per hour.

Mandrel and head are mounted in an angular position to facilitate loading of pressed steel parts and unloading of the main body assembly, which is welded in a single pass. The dies have alloy inserts to coincide with the projections on the work piece. Two small air-operated hold-down clamps act as an auxiliary clamping unit and precisely locate the work parts in position during the welding sequence. THE FEDERAL MACHINE AND WELDER CO., Warren, O.

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- STAINLESS STEEL ELECTRODES
- MILD STEEL ELECTRODES
- HARD-SURFACING ELECTRODES

Substantial stocks of welding rod, as well as other welding supplies, now enable us to make quick deliveries. Prompt shipments also can be made on Welding Machines, Havens Protected "C" Clamps, and Protect-O-Metal (used to simplify removal of welding spatter). Phone, wire or write our warehouse nearest you.

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BALTIMORE (3)	Gilmor 3100
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	REctor 2-6560—BErgen 3-1614
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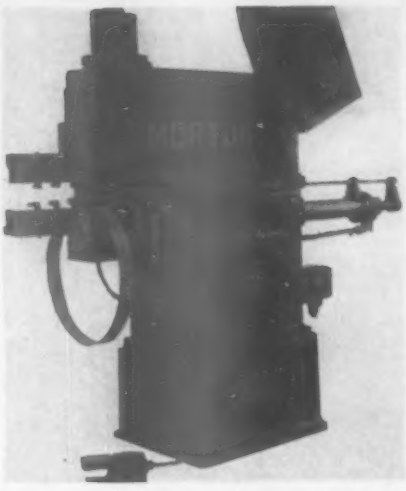
ST. LOUIS (3)	LUcas 0440
TWIN CITY-ST. PAUL (4)	NEstor 7311

UNITED STATES STEEL



Flash trimmer for removing upset metal from pieces flash or butt welded

Flash Trimmer

A SPECIALLY made cutting machine for flash and butt welds is available in sizes ranging from 8 to 12 in. of trimming capacity and ⅛ in. metal thickness. This trimmer is arranged for removal of the upset metal produced by flash or butt welds made by the resistance-welding process. Each of its upper and lower rams has three or more tool holders, while adjustable-bit cutters are used with a fine-pitch screw for cutter adjustment. The work is placed over the lower horn, and the upper ram automatically lowers and clamps the work. The rams trim on the draw cut or inward stroke. When trimming is completed, both rams return to the outward position and stop so that operator can remove the work and place another piece in trimming position. MORTON MFG. CO., Broadway and Hoyt, Muskegon Heights, Mich.

☆ ☆

Flux-Coated Rods

EUTECTIC WELDING ALLOYS CORP., 40 Worth St., New York City 13, has eliminated the need for flux when performing low-temperature oxyacetylene welding by flux coating its rods. The heavy coating permits the rod to flow without additional fluxing of either work or rod. These rods are offered with coatings suitable to the welding of cast iron, alloy steels, stainless, aluminum, bronze, copper, galvanized steel and other metals. These various all-position rods are clearly labeled.

☆ ☆

Welding Timer

THE No. 52D "Timatron" is said to eliminate guesswork in spot welding machines up to 10 kva. A hand control adjusts timing from 0.1 to 5 seconds, and this timing, set for a certain thickness, remains automatic through the entire production run. The dial is calibrated so that adjustment can be quickly made to switch from one metal thickness to another. This timer measures 5⅛ in. by 9 in. by 4¾ in. deep. RIPLEY CO., INC., Middletown, Conn.

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HIGH FREQUENCY
Automatic Arc
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PILOT ARC

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PLUS these *EXTRAS*

- ✓ Greatly reduces radio interference as compared with spark-gap type oscillator.
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DALLETT'S RS Series of Pneumatic Hammers are of the valveless type. This lever throttle control model admits a smooth, graduated flow of air while permitting the exhaust air to pass through the bushing to blow away chips and scale.

DALLETT'S RS Series Valveless Type →

WRITE FOR BULLETIN W-500

← **DALLETT'S K Series Coin Valve Type**

DALLETT'S K-Series are coin-valve type Pneumatic Hammers designed for light chipping, removing fins and sand from castings, and for general scaling.

DALLETT'S *Weld-flux* Scaling Hammers feature the Dallett Safety Retainer Bushing. They are precision built, light in weight, simple in construction—and are built to take it.

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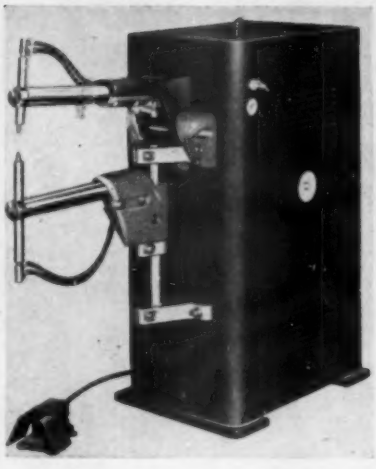

50-kva spot welder for production work on mild steels up to 16 gauge

Spot Welder

MAXIMUM production speed without impairment of weld quality is one of the claims made for a 50-kva spot welder offered by BANNER PRODUCTS CO., 4960 N. 29th St., Milwaukee 9. Air-operated by a foot pedal, the unit is used with either 220 or 440 volts, 60 cycles a-c. It has eight heat ranges and is recommended for welding up to 16-gauge clean mild steel sheets on either a job shop or production basis. Throat depths are 12, 24 and 36 in.; stroke, 2¼ in. A 30-kva model is also available.

☆ ☆

Tensile Tester

LONGER specimens as well as specimens that show considerable stretch may be tensile tested with the new "Hercules model" physical tester. Uprights have been lengthened to give a 13-in. spread between grips, which are quickly interchanged from tensile to transverse, compression or shear tests. A keyless power screw adds to the life of the main drive gear. Additional features are the hardened steel sleeve to guide the power screw, a cast-aluminum gear housing, ball-bearing power shaft supports and an improved shock absorber screw. Unit is available in seven ranges: 0-25, 0-500, 0-1,000, 0-2,500, 0-7,500 and 0-10,000 lb. W. C. DILLON & Co., 5410 W. Harrison St., Chicago 44.

☆ ☆

Hard-Facing Rods

IN ORDER to combine its "Sprayweld" process with metallizing, WALL COLMONY CORP., 19345 John Rd., Detroit 3, offers a new plastic-bonded rod in ⅛ and 3/16 in. diameters. It consists of powdered hard-facing alloy combined with a plastic binder. As the rod passes through the flame of the metallizing gun, the plastic burns away. After the desired amount of overlay has been applied (a minimum of .010 to a maximum of .125), it is bonded to the base metal by means of an oxy-acetylene torch, induction-heating equipment or controlled-atmosphere furnace. Final result is a molecular bond between the hard-facing and base metal identical to that obtained when the same alloy is applied in rod form.

Do welding costs have you up a tree?

● Replace that obsolete welding equipment with Miller A.C. Welders. Nothing to wear out—no rotating parts—installation and operation costs on Miller A.C. Welders are less than that of D.C. equipment of equal capacity.

Miller A.C. Welders are available in ten Models and Sizes, all emphasizing continuous current—arc stability—safety—speed—and efficiency.

Stop at your distributor's store and try the Miller, or write for full information.

"Sold only through recognized distributors."

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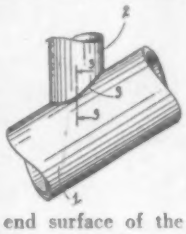
APPLETON, WISCONSIN

From the Patent Office

Pipe Joint

2,425,470. KENNETH V. HART, Cleveland. Filed Dec. 15, 1944. Issued Aug. 12, 1947.

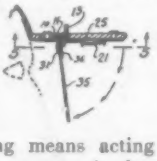


A resistance-welding process for joining an end of a tubular member to a side of an opposed member. Weld has a radical thickness at least 50% greater than the wall thickness of the tubular member. The end surface of the tubular member penetrates into the opposed member to between 15% and 25% of the wall thickness of the tubular member; penetration is incident to pressure applied during the welding process. Heat penetration, as evidenced by carbon precipitation, does not extend the full wall thickness of the tubular members.

☆ ☆

Eyeshield for Headgear

2,425,847. HUMBERTO VACA, Detroit. Filed July 7, 1945. Issued Aug. 19, 1947.



An eye shield for use in conjunction with a visor on a cap. It has a body piece attached to the underside of the visor, a slide member on the body piece, spring means acting upon the slide member to urge it forwardly, a shield pivotally mounted on the slide and movable on its pivot so as to extend downwardly from the visor and before the eyes of the wearer in operative position. In inoperative position, the shield is in proximity to the underside of the visor and generally parallel to it. Means for holding the shield member in its inoperative position is automatically releasable upon forward movement of the slide member.

☆ ☆

Spot-welding Control System

2,425,183. LEO C. HALL, Cincinnati. Filed March 24, 1945. Issued Aug. 5, 1947.

In an arc-welding system, a d-c generator having a field winding, a circuit for supplying an exciting current to the field winding from a current source independent of the generator current, a grid-controlled tube having anode and cathode elements in the field winding exciting circuit, a grid circuit which controls the field winding exciting current. A manually regulatable variable resistor in the grid circuit is selectively varied in order to modify the exciting current and relatively govern the generator current. The rectifier means is provided in shunt connection with field winding exciting circuit.

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Write for fully descriptive literature and prices.

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WILLOW GROVE, PENNA.
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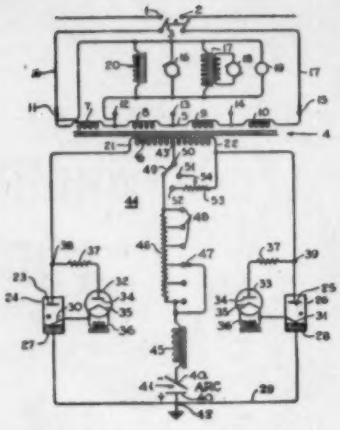
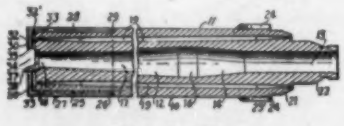


Electronic Arc Welder

2,426,964. Edwin M. Callender, Cynwyd, Pa., assigned to The Budd Co., Philadelphia. Filed July 15, 1944. Issued Sept. 2, 1947.

An arc-welding circuit comprising power terminals, a transformer, a center tap connected to transformer, rectifier tubes, connected with the cathodes joined together in opposition and across the transformer. The welding electrodes and a reactor are connected in series with each other between the center tap of the transformer and the tube cathodes, forming a branch circuit through which current is transmitted from each rectifier in succession on application of alternating current to the transformer. Switching means is provided for shifting the connection of the branch circuit from the transformer center tap to the anode of one rectifying tube to enable the reactor to discharge through the tube.

☆ ☆



Torch Tip

2,425,709. James H. Bucknam, Cranford, and Ivan P. Thompson, Elizabeth, N.J., assigned to The Linde Air Products Co., New York City. Filed March 6, 1943. Issued Aug. 19, 1947.

A cutting tip comprising an elongated member having a central oxygen passage extending longitudinally and a plurality of acetylene passages arranged in spaced parallel relation to the oxygen passage. The discharge ends of all passages terminate in one end having a face lying in a plane disposed at right angles to the longitudinal axis of the elongated member. The end cap has a cylindrical skirt fitting an annular end portion of the member; bottom panel of cap has a shoulder seated on the end face to space the inner surface of the panel a fixed distance from the face. The cap also has a bottom panel provided with an opening, the inner edge of which is laterally offset with respect to the inner edge of the discharge end of the oxygen passage; this panel disposed so as to direct the acetylene discharged by the acetylene passages inwardly toward the single stream of oxygen as the latter leaves the discharge end of the oxygen passage.

Our Monolithic Filler assures maximum capacity in minimum pumping time. Its design eliminates acetone spitting and gives you cylinders that withstand hardest service. All sizes. We also sell new and used cylinders for other gases.

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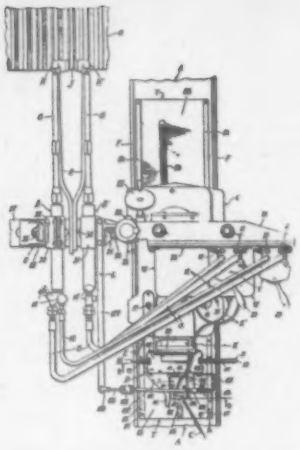

Flame-Hardening Apparatus

2,425,751. Frank McGuire, Jr., Bogota, N. J., assigned to The Linde Air Products Co., New York City. Filed June 29, 1940. Issued Aug. 19, 1947.

Method of hardening the oppositely disposed surfaces of a tapered gear tooth positioning torch head with respect to each surface. Each of the torch heads directs a plurality of high-temperature flames against a portion of one of the surfaces extending from a point adjacent the bottom of the tooth to a point adjacent the top of the tooth. Movement is effected between heads and tooth along paths extending from the small to the large end thereof. The gases to the torch heads are turned on automatically in response to arrival of the torches at a starting point in their paths. Speed is decreased automatically in response to progress of torches along their paths. The relative movement of one head is along a fixed path which diverges from the side of the tooth, and the relative movement of the other head includes a transverse component away from the first head. Thus the height of the effective area heated by the flames progressively increases as the speed decreases toward the larger end of the tooth, and the increased spacing permits the slower operating speed without melting the surface under treatment. The result is a soaking heat with greater case penetration and spread.

☆ ☆

Arc Torch

2,425,830. Elmer R. Ross, San Diego, Calif., assigned to Solar Aircraft Co., San Diego. Filed April 23, 1945. Issued Aug. 19, 1947.

A double-electrode arc torch comprising a handle having two parallel electrode-holding rod members projecting from one end. These are adapted to support a pair of electrodes for movement toward and away from each other. Handle is a tubular casing of insulating material having a closure plug of insulating material at its forward end through which the rod members extend. One of the rod members is tacked to the closure plug while the other is slidable within it. Slidable within the casing back of the closure plug is a block having longitudinal apertures through which the rod members extend; members are locked to the slidable block for movement therewith.

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AC ARC WELDER

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New design improvements and operating features make the ELGIN your answer to *low operating costs, maintenance savings.* Easy to start and to operate. Cool in operation. 4 models . . . 150, 200, 250, and 350 amps.

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LEFT
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OPPORTUNITIES FOR WELDING

Plate, Pipe and Tank–Structural–Buildings–Repairs and Hard-Facing

● Projects $500,000 and more in value.
† Federal Government Projects.

Plate Welding Pipe & Tank

Contract Awarded

Alabama—GAS TRANSMISSION LINES—Alabama Gas Co., Montgomery, 3½ mi. 8 to 16 in. gas transmission lines, force account. **$50,000.**

Contract Awarded

Ala., Brewton—GAS SYSTEM—City, design and construction natural gas sys., to R. Littrell, Opelousas, La. **$110,000.**

Contract Awarded

Ala., Flomaton—GAS SYSTEM—City, design and construction, natural gas sys., to R. Littrell, Opelousas, La. **$90,000.**

Contract Awarded

California—GAS PIPELINE—Pacific Gas & Electric Co., 245 Market St., San Francisco, 10 mi. gas pipeline, to Pacific Pipeline and Engineers Ltd., 2128 San Pablo St., El Cerrito. Est. over **$40,000.** Bids 8/19.

Rejected Bid

●†**California**—PIPES, TANK, etc.—Bureau Reclamation, Dpt. Interior, Customhouse, Denver, Colo., rejected bids June 23, pump discharge pipes and surge tanks for Tracy Pumping Plant, Central Valley Proj., Spec. 1856. W. R. Young, ch. engr. L. B. **$2,228,000.** Low Bidder reported W. E. Oct., p. 124.

Contract Awarded

●**Calif., Los Angeles**—STEAM PLANT—Los Angeles Water & Power Dpt., 311 S. Spring St., main bldg. superstructures for Units 3, 4 and 5 transformer foundations, cable tunnel from control house to main bldg., Harbor Steam Plant, Spec. 9943, Wilmington, to Guy F. Atkinson Co., 22,233 S. Santa Fe Ave., Long Beach, **$1,916,667.** Est. **$2,000,000,** Low Bidder reported W. E. Oct., p. 124.

Contract Awarded

●**Colo., Denver**—REFINERY—Bay Petroleum Corp., Midland Savings Bldg., increasing gasoline refinery capacity (incl. U.O.P. Thermal unit and Polymerization unit) force account. **$900,000.**

Contract Awarded

●**Conn., Bridgeport**—GAS CONTAINER—Bridgeport Gas Light Co., 815 Main St., 262 ft. high, 5 million cu. ft. capacity storage tank gas container. Housatonic Ave. Owner builds. **$1,250,000.**

Contract Awarded

●**Ind., South Bend**—GAS HOLDERS—Northern Indiana Public Service Co., G. V. Bennett, mgr., South Bend, two 12,000,000 cu. ft. steel gas holders, to Koppers Co., Inc., Koppers Bldg., Pittsburgh, Pa. **$1,200,000** and est. **$1,250,000,** respectively. Awarded 9/17.

Contract Awarded

●**Mississippi**—GAS MAIN—Tennessee Gas & Transmission Co., Commerce Bldg., Houston, Tex., 40 mi. 26 in. welded joint natural gas main, incl. crossing of Mississippi River. Owner builds. **$2,800,000.**

Contract Awarded

●**Missouri and Illinois**—CRUDE OIL PIPE-LINE—Stanolind Pipeline Co., Stanolind Bldg., Tulsa, 2, Okla., Job. 2, 46.5 mi. 20 in. pipeline between East Fort Madison, and Laura, Ill., to Associated Contractors & Engineers, 912 W. Gray St., Houston, Tex.; Job 3, 45.8 mi. 20 in. and 15.1 mi. 82 in. pipeline between Laura and Garfield, Ill., to J. R. Horrigan Constr. Co., Commerce Bldg., Houston, Tex., and Job 4, 60.6 mi. 22 in. pipeline between Garfield and Manhattan, Ill., to C. C. Witaker Co., D-Wag Bldg., Fort Worth, Tex. Approx. **$10,000,000.**

Contract Awarded

●**Tex., Houston**—COLD STORAGE PLANT, WAREHOUSE — J. C. Simms & Assoc., 1204½ Wayside Dr., cold storage plant and warehouse. Owner builds. **$1,500,000.**

Contract Awarded

●**Oklahoma** — OIL PIPELINE — Interstate Oil Pipe Line Co., P. O. Box 1349, Tulsa, Mississippi River crossing for 12 in. 3,300 ft. long, 5 ft. below bed of river depth crude oil pipeline on 50 m. line between Oklahoma City and Maysville pool, to Oklahoma Eng. Co., P. O. Box 1349, Tulsa. **$133,000.**

Contract Awarded

●**Oklahoma**—CRUDE OIL PIPE LINE—Sunray Oil Corp., Philtower Bldg., Tulsa, 93 mi. 6 in. crude oil pipeline between Beckett and Allen, to Pipe Line Service Co., Seminole. **$925,000.**

Contract Awarded

Oklahoma—OIL PIPELINE—Sunray Oil Corp., Philtower Bldg., Tulsa, Zone 3, 15 mi. 6 in. oil pipeline from Beckett to Velma. Owner builds. **$175,000.**

Contract Awarded

●**Okla., Bartlesville**—STORAGE TANK—City, elevated water storage tank, to Chicago Bridge & Iron Works, 332 S. Michigan Ave., Chicago, Ill. **$40,800.** Est. **$45,000*****24 in. water supply lines and fittings to Lock Joint Pipe Co., 13 and Gentry St., North Kansas City, Mo. **$171,468,** est. $180,000***filters and chemical equipment for 5 m.g. filtration plant, to Carrothers Constr. Co., Paola, Kan., **$81,000,** est. **$85,000*****5 m.g. filtration plant and river intake to Long-Sinclair Constr. Co., Rialto Bldg., Kansas City, Mo., **$556,719,** ets., **$575,000.** Grand total, **$859,997.** Bids 8/20.

Contract Awarded

●**Okla., Velma**—PLANT—Skelly Oil Co., Skelly Bldg., Tulsa, natural gasoline plant taking gas from Velma gas fields and transporting residue gas to Oklahoma Natural Gas Co. pipeline sys. in Seminole, to Born Eng. Co., Admiral Blvd., Tulsa. **$7,000,000.** Awarded 9/8.

Low Bidder

●**Oregon** — TUNNEL — California-Oregon Power Co., Medford, August 5, 5,600 ft. rein.-con. tunnel in Toketee hydroelectric development, near Roseburg, Douglas Co. from L. E. Dixon, Medford. **$1,056,750.**

Contract Awarded

Oregon—GAS MAIN—Portland Gas & Coke Co., Public Service Bldg., Portland, laying 13½ mi. 6 in. gas main in Hillsboro-Forest Grove area and in Park Rose and Rose City Park Dists. of Portland, Washington and Multnomah Counties, to P. S. Lord, 4507 S.E. Milwaukee St., Portland, **$165.00.** Awarded 9/19. E. I. Hall, Public Service Bldg., Portland, engr.

Contract Awarded

●**Pa., Pittsburgh**—BOILER HOUSE—Jones & Laughlin Steel Corp., 3 and Ross Sts., design and constr. boiler house, facilities for 3 steam generators, South Side Works, to Rust Eng. Co., Clark Bldg. **$4,000,000.**

Low Bidder

Pa., Southampton — WATER SUPPLY SYSTEM—Upper Southampton Municipal Authority, Southampton, water supply sys., tank and tower, from Pittsburg-Des Moines Steel Co., Neville Island, Pittsburgh, **$45,200,** well and distr. sys., and pump house, from Bucks Co. Constr. Co., South Langhorne, **$129,147.** Gannett, Fleming, Corddry & Carpenter, Inc., 3700 Derry Paxtang, Harrisburg, engrs.

Contract Awarded

●**Texas and New Mexico**—GAS PIPELINE—El Paso Natural Gas Co., El Paso, 250 mi. 24 in. welded joint natural gas pipeline between Dumas, Tex. and Eunice, N. M., force account. Approx. **$10,600,000.**

Contract Awarded

●**Texas**—GAS PIPELINE—United Gas Pipe Line Co., 1525 Fairfield Ave., Shreveport, La., 33 mi. 20 in. natural welded joint, gas pipeline between Carthage and vicinity of Longview, Panola Co. Owner builds. **$1,320,000.**

Low Bidder

Tex., Fort Worth—STEEL TANK, etc.—City, W. O. Jones, mgr., Sept. 2, 2 m.g. steel tank on 50 ft. steel frame tower, from Chicago Bridge & Iron Wks., Hunt Bldg., Tulsa, Okla., **$217,800,** est. $210,000; elevated steel water tank, 70 ft. tower, tower of radio tone design or spheroidal design, from Pittsburgh-Des Moines Steel Co., Praetorian Bldg., Dallas, **$143,640.** Est. **$145,000.**

Contract Awarded

●**Tex., Silsbee**—PLANT—American Republics Corp. & Houston Oil Co., Esperson Bldg., Houston, gas recycling plant to Gasoline Plant Corp., Niels Esperson Bldg., Houston. **$3,000,000.**

Contract Awarded

Utah, Salt Lake City—STEEL PIPE-LINE—City, c/o Irma F. Bitner, recdr., City and County Bldg., 13,700 lin. ft. 48 in. steel pipeline from 17th South St. to Park Reservoir, to United Concrete Pipe Corp., Baldwin, Calif. **$493,890.** Bids 8/7.

Structural Bridges and Others

Contract Awarded

●**Arkansas**—BRIDGE SUPERSTRUCTURE, etc.—State Hy. Dpt., Little Rock, superstructures and bridges, Lawrence Co., to Massman Constr. Co., 737 New York Life Bldg., Kansas City, Mo., **$672,441;** bridges, Greene Co., to Pioneer Constr. Co., Malvern, **$134,147.**

Low Bidder

●**Arkansas** — BRIDGES — State Hy. Dpt., Little Rock, Sept. 12, bridges Bradley Co., from S. M. Dixon, Warren. **$511,922.**

Low Bidder

California — SUPERSTRUCTURE—State Div. Hys., Sacramento, Sept. 17, superstructure for bridges, etc., San Joaquin Co., from Judson-Pacific-Murphy Corp., 1200 17 St., San Francisco, **$416,422;** bridge superstructure, etc., Humboldt Co., from Guy F. Atkinson Co., Orange and Railroad Aves., South San Francisco, **$347,355.**

Contract Awarded

●**California** — SUPERSTRUCTURE—State Div. Hys., Sacramento, imprv. superstructure for overhead crossing Santa Barbara Co., to Carl N. Swanson Co., 1095 Stockton Ave., San Jose. **$527,522.** Bids 8/13, awarded 8/22.

Low Bidder

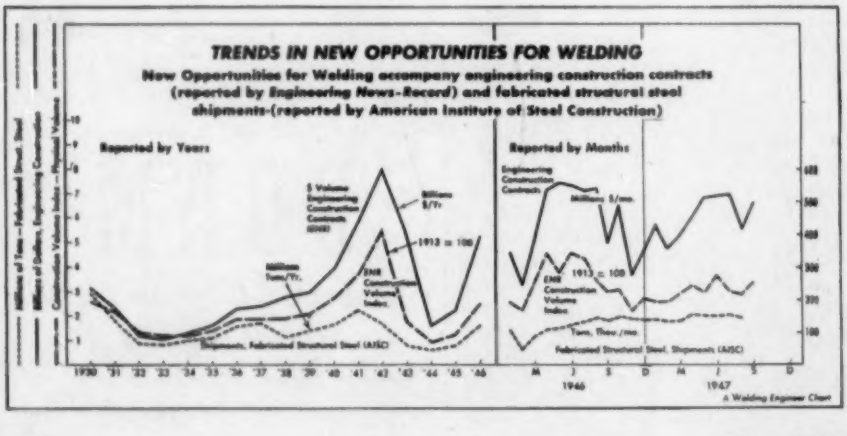
California—BRIDGE SUPERSTRUCTURES—State Div. Hys., Sacramento, Sept. 10, portions superstructures 2 bridge, Glenn Co., from Judson-Pacific-Murphy Corp., 1200 17 St., San Francisco, **$228,990*****6 bridges Mariposa Co., from E. H. Peterson & Son, 5691 Dam Rd., Richmond, **$83,826*****overhead crossing, Monterey Co., from Dan Caputo, Route 1, Box 397, Moorpark Ave., San Jose, **$183,527.**

Low Bidder

●**Calif., Long Beach**—TRANSIT SHED—Bd. Harbor Comm., 13333 El Embarcadero, Sept. 19, steel frame transit shed and Berths 6 and 7, Pier A, from Peter Kiewit Sons Co., 345 Kieways Ave., Arcadia. **$1,426,000.**

Contract Awarded

Calif., Weaverville — BRIDGE SUPERSTRUCTURE—Trinity Co., Courthouse.


TRENDS IN NEW OPPORTUNITIES FOR WELDING
New Opportunities for Welding accompany engineering construction contracts (reported by Engineering News-Record) and fabricated structural steel shipments (reported by American Institute of Steel Construction)
Reported by Years
Reported by Months
1913 = 100
1946
1947
A Welding Engineer Chart